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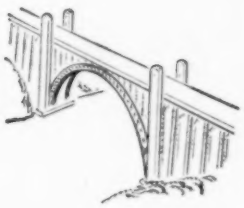

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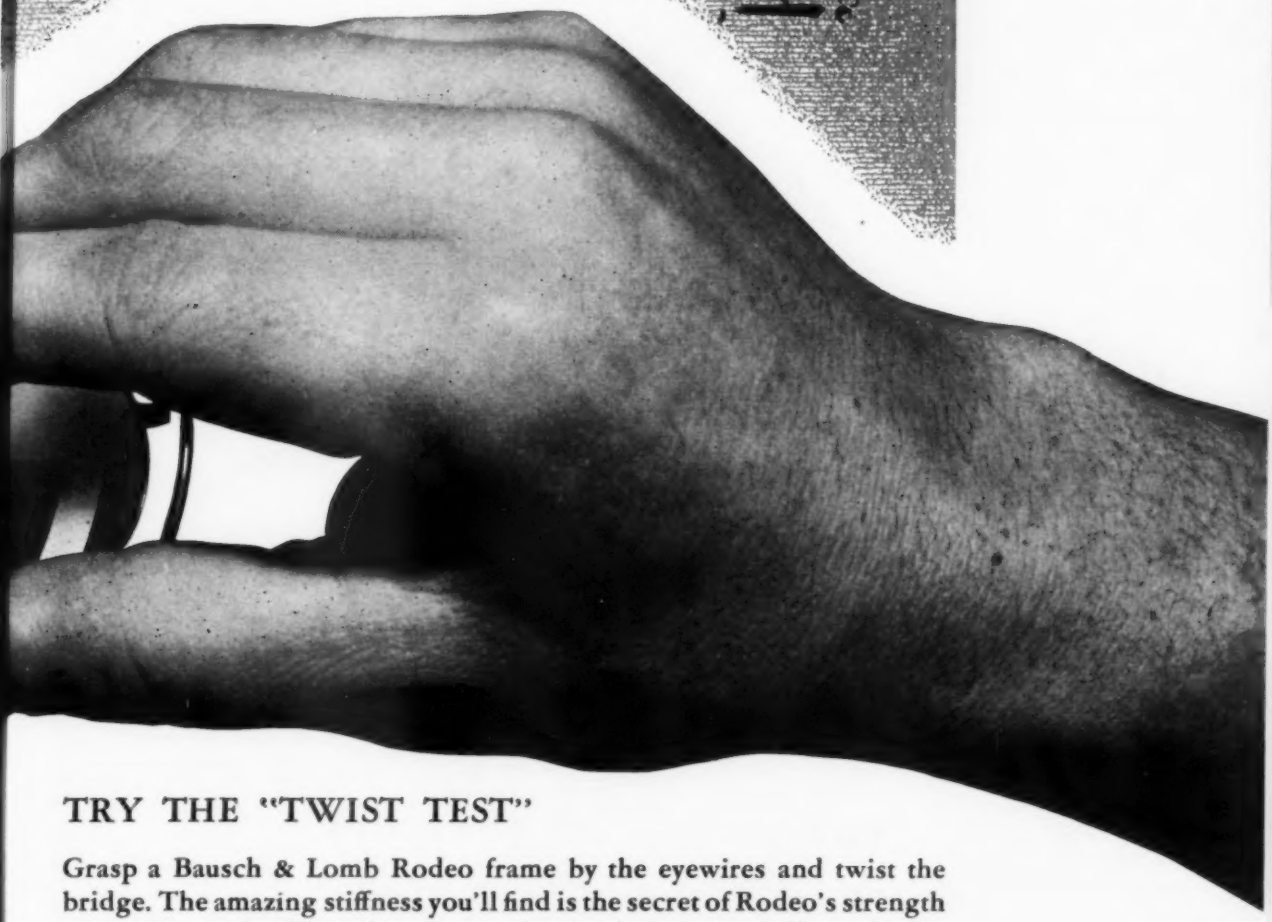

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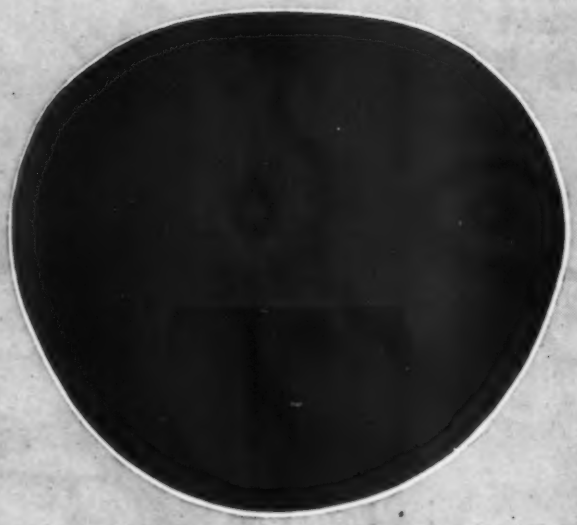

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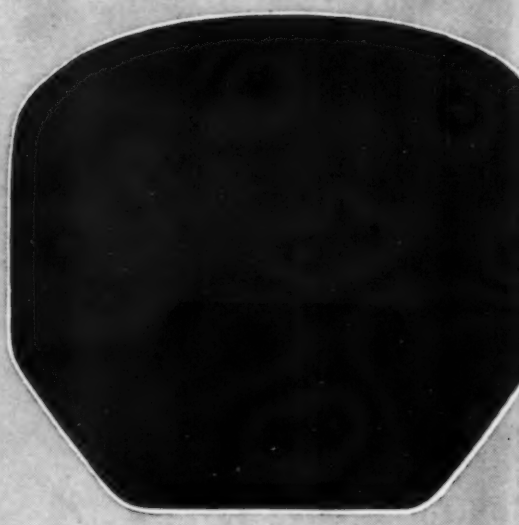

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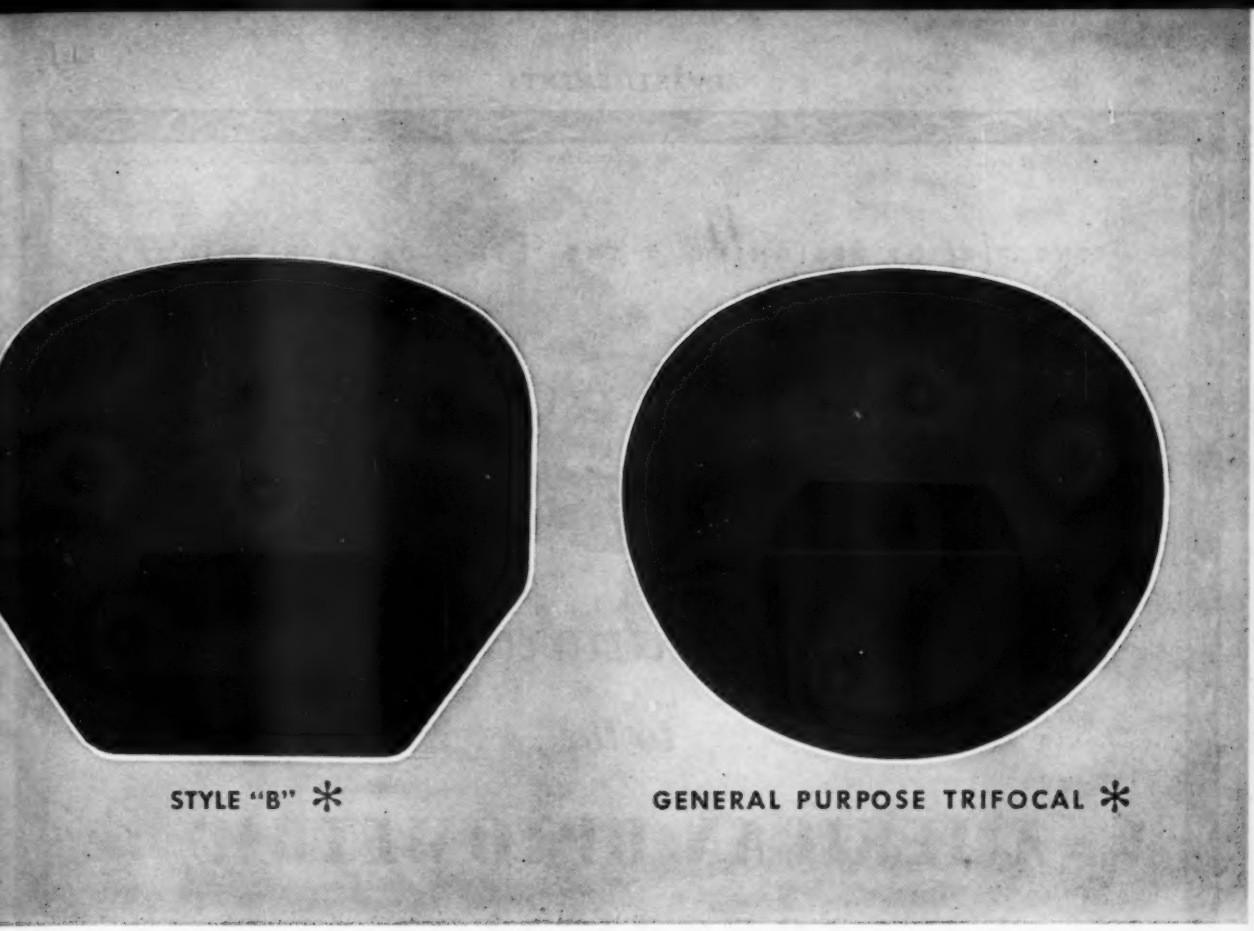

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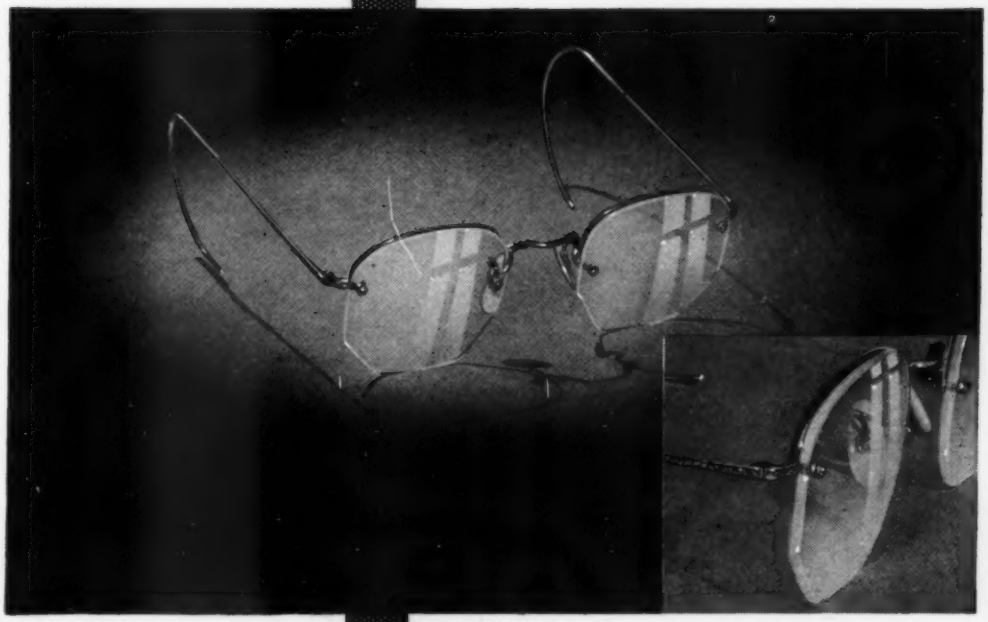

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THE NATURE OF AMETROPIA*

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Until recently the meaning of refractive error, as far as causative factors are concerned, was largely an academic problem; one which only teachers and text-book writers worried about. In the past ten years or so, however, the exact nature of refractive errors has become important to all who practice optometry. We have all heard the very vocal group which insists that myopia is entirely functional, that no one need become myopic since this error is due to improper posture of the focusing mechanism and that anyone who teaches or thinks that myopia is caused by excess axial length of the eyeball is 100 years behind the time. The discovery at the Dartmouth Eye Institute that small amounts of aniseikonia may lead to asthenopia or improper spatial projections or both has also made the nature of refractive errors important. This is especially true where anisometropia or antimetropia exists. This phase will be discussed in more detail later.

Before considering the evidence that has accumulated as to the nature of refractive errors, it may be well to stop momentarily to discuss briefly what might be termed the classical description. It has been customary to divide refractive errors into two categories; namely, axial and refractive. If the refractive power of the eye is normal, the eye may be hypermetropic due to the axial length of the eye being too short, or the eye may be myopic due to the axial length being too long. Post-mortem examinations have shown that these two concepts have some basis in fact. Also,

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*Read before the Alameda-Contra Costa Optometric Association [California]. Submitted on April 10, 1947, for publication in the June, 1947, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist. Fellow, American Academy of Optometry. Assistant Professor of Optometry.

there is the evidence of myopic crescents and other evidences of retinal stretching. Now, if we assume the axial length of the eye to be normal, the eye may be hypermetropic due to the refractive power of the eye being too small or the eye may be myopic due to the refractive power being too great. The refractive power varies with the curvature of the cornea and lens. This type of error is most clearly defined in the transient myopia which occasionally accompanies the use of sulfa drugs.[1, 2, 3] The swelling of the lens has been clearly observed with the aid of the slit lamp. The refractive power also varies with the index of refraction of the various media of the eye: cornea, aqueous, lens and vitreous. This type of error is clearly seen in the myopia which tends to go along with cataract or in the myopia of diabetes. Still a third kind of refractive type of error is possible. The axial length of the eye may be normal and the refractive power normal, but due to an improper relationship of either the power of the cornea with respect to the lens, or an improper separation of these two elements, the position of the secondary principal plane may be incorrectly positioned to bring the focus upon the fovea.[4]

To sum up: refractive errors may be classified into two general categories: axial and refractive. The latter may be further subdivided into: index, curvature, and principal plane location.

In regular routine refraction an attempt is made by means of skiametry and subjective testing to locate the far point of the eye. Due to several inherent errors and to poor technique skiametry alone, while theoretically of great accuracy, gives results which are not altogether trustworthy. Empirically we have found, that as a general rule, the focal length of that maximum convex lens or minimum concave lens which gives maximum acuity seems to correspond with the far point distance of the eye. From simple laws of geometrical optics, this concept of subjective testing appears to agree very closely with theoretical calculations. Recently there has been a subtle change in this definition of subjective testing so that now there are many who advocate that the far point is located by that maximum convex lens which gives a bare 20/20 visual acuity. The difference in definition should become apparent at once. Be that as it may, these two common methods of testing measure only the departure of the refractive power as compared to the axial length of the eye from an arbitrary standard, emmetropia. From these tests we have no way of segregating definitely the type of ametropia, whether it be axial or refractive.

There are other methods used in the laboratory to locate the far point of the eye such as stigmatoscopy, the subjective coincidence optom-

eters, such as Fry's and Scheiner's, and the objective coincidence optometer of Fincham. Again there are no positive clues as to the type of error. Clinical emmetropia may not be actual emmetropia.

There is one routine testing device which does segregate certain refractive errors. With the ophthalmometer, we are able to measure the curvature of the anterior surface of the cornea. It appears that a good percentage of astigmatic errors of refraction can be accounted for by the toroidal curvature of the cornea. Thus we have good evidence that nearly all astigmatism is refractive ametropia of the curvature variety.

In an effort to determine the possibility for the existence of latent hypermetropia or of pseudo-myopia, which are curvature ametropias, pioneer optometrists added certain dynamic tests to their examination procedures. One has only to read the writings of these men, such as Cross, to find that the object for these additional tests, such as dynamic skiametry, positive and negative relative accommodation, and the cross cylinder, was to find out if latent hypermetropia or pseudo-myopia did exist so that more convex lens power might be added to the subjective finding, which would in time, give clear vision when the patient looked at distant objects. The fact that these tests today are correlated with certain others for the purpose of arriving at some prescription which may be adequate for near use, such as reading, without perhaps influencing the correction for distance, indicates that what these pioneers developed was not a sure way to separate axial from refractive ametropia, but merely clues or sign posts which considered with the case history not infrequently led to the discovery of these hidden errors.

By means of statistical analyses and other studies it is possible for a skilled optometrist to arrive at a satisfactory prescription for most patients, without being able to classify the ametropia as to type. Our clinical evidence being scarcely better than hunches, does not allow us to make any judgment as to the type of error uncovered.

Optometrists who remember their student days in which they spent some time calculating theoretical image sizes for different types and degrees of ametropia may remember that the size of the retinal image, when a correction lens is mounted before the eye in the primary focal plane of the eye, depends upon the type of ametropia. In this position the lens has no influence on the image size in axial ametropia. A myopic subject of 3.00 D. has exactly the same retinal image size as a hypermetropic subject of 5.00 D. when the ametropia is axial. On the other hand, when the error is refractive in nature the image size varies directly with the amount of the error. The change in size being about 1.7 per cent per

diopter. The image being larger in corrected hypermetropia and smaller in myopia.

Today we have no accurate method of measuring the exact size of the image on the retina. We can, however, compare the size of one ocular image with the size of the other by means of the eikonometer. If we made these measurements in cases of anisometropia we could get some idea, at least, whether the errors were axial or refractive. Ogle[5] has made such an investigation and has reported that approximately 30 per cent of the subjects measured had purely axial ametropia, 30 per cent refractive ametropia, and 40 per cent mixed ametropia. Subjects falling in the mixed group had differences in the image size between that which would be expected in purely axial and purely refractive conditions.

The Russian ophthalmologist, Tron, has used a different approach to the problem.[6] He has attempted by actual measurement to determine the cause of refractive errors. He has measured the curvature and hence the power of the anterior surface of the cornea. Using Tscherning's ophthalmophakometer, he has measured the curvature of the posterior corneal surface, the anterior and posterior lens surfaces. By still other optical methods he has located these surfaces along the optical axis of the eye. Then by using assumed indices of refraction he has determined the refractive power of the eye and compared this to the data obtained in clinical refraction with complete cycloplegia.

Tron's results compare very favorably with those of Ogle. Neither of these methods, however, allow one to separate curvature ametropia from index. Tron's method does allow one to calculate the location of the principal planes of the eye. He found that about two per cent of the refractive type of ametropia was due to the improper position of the principal planes. Thus by these methods, we know that some 30 per cent of all refractive error is axial, 28 per cent either curvature or index ametropia, two per cent is due to location of principal planes, and 40 per cent is mixed axial and refractive. From this evidence it would appear that since any functional ametropia must be curvature in nature that not more than 28 per cent of all types of refractive errors could fall in this classification.

A third method of investigating the relationship of axial length and refractive power has been perfected by Goldman and Hagan.[7] When the fovea is stimulated by a very narrow beam of X-rays, a flash of light is seen. By mounting the X-ray parallel to the axis of the eye and shooting the rays through the eye at right angles to the axis it is possible to measure the exact length of the eyeball from the anterior surface of the

cornea to the fovea. So far these men have only reported on their initial investigations. The addition of this method of measuring axial length to the methods of Tron should allow one to segregate curvature and index ametropia.

Such an investigation has been reported by Stenström[8] in a doctorate thesis. He used the statistical method of analysis calculating the coefficient of correlation of the refractive error with various constants of the eye such as axial length, refractive power of the cornea, etc. He reports measurements on 1,000 eyes. The results indicate that axial length plays the major role in determining the type and amount of the ametropia. The coefficient of correlation between the state of refraction and axial length was -0.76 ± 0.014. (A perfect correlation would be -1.0). There was no significant correlation with any other constant.

Those who claim that ametropia is functional in origin seem mostly interested in the problems of myopia. They seem to consider that the wearing of concave lenses is to be avoided at all costs but that convex lenses are all right. If one attempts to follow this trend historically and find its roots, it seems to arise from the fact that myopia is a developmental anomaly that appears at about the same time that demand is put on the eyes for near work. Hence myopia must be due to some improper posture—an attempt on the part of the organism to adapt itself to its environment. This correlation may be entirely accidental. The fact that seems to be overlooked is that puberty occurs at about the same time. The truth of the matter is that many things are related by pure accident. An absurd example will illustrate the point. Nearly all boys begin to have their beards appear and to commence shaving in high school. Thus there is a positive correlation between secondary education and the growth of hair on the face. Thus if a parent wants to keep his son from having a beard all he has to do is to keep him from going to high school. This is of course ridiculous but it will serve to illustrate what is meant by accidental or unrelated correlations. Adolescence is a period of great changes in the human organism. The whole internal environment changes. The glands of internal secretion change the whole body metabolism. It would be strange indeed if some ocular changes did not occur in some individuals.

Occasionally college students, who are as a rule approaching the end of the period of adolescence, exhibit myopia for the first time. In the last three years in the University of California Optometry Clinic the writer has had 21 such new myopic patients out of a total of a little over 600, or approximately three per cent. Of these subjects 18, or 86

per cent were away from home for the first time in an entirely new environment. On the other hand, only three or 14 per cent were "at home students." This is a strange factor if myopia is due only to close application of the eyes. The writer does not imply that a change in environment is the cause, he merely wishes to point out that there are other equally valid correlations.

There is one other factor that seems to connect myopia with maturation and that is its tendency to stop progressing some time between the 18th and 25th birthday. This is the period during which growth and development practically comes to a standstill. Yet this is the period of greatest demand as far as vision is concerned. Is this just another strange coincidence?

The history of optometry is replete with various methods for the correction of myopia all of which, by inference at least, are based on the possibility that myopia is progressive and functional.

The first and probably still the most popular method is that of under-correction. This method almost always is unsuccessful in preventing future increases in the error. In fact the percentage of success is so small that the probabilities are that those cases of myopia which become arrested after the wearing of such an undercorrection would have done so in spite of the treatment rather than because of the treatment. There is an obvious fallacy in undercorrection. If a patient appears complaining of recent blurring of distant vision and it is now found that he is 1.00 D. myopic, the evidence from his history would indicate that at one time he was probably emmetropic or maybe even a little bit hypermetropic. Thus as the myopia progressed he was at one time a 0.25 D. undercorrected, a little later a 0.50 D., still later a 0.75 D., and now he is a 1.00 D. undercorrected; yet the myopia continually progressed even with natural undercorrection. This process is repeated for everyone in whom the myopia increases.

Next there is the idea of combining with undercorrection the maximum amount of base-in prism that can be tolerated by the patient. The logic being that undercorrection in minus keeps accommodative demand down while the base-in prism does the same for convergence. While this method appears more logical than straight undercorrection, the results are no better.

All sorts of combinations of full correction for distance with an add for near, in bifocals, for example, have been tried. Nearly every type of correction has been given myopic patients. The results, as far as pre-

venting the future increase in myopia is concerned, have been uniformly poor.

In the last few years, orthoptics has been held up as the answer to the problem of myopia. The reports on two orthoptic projects, the one at Baltimore and the other at St. Louis, changed the tune from the cure of myopia to the improvement of visual acuity and the control of future progression. At the University of California we have had some success in the improving of visual acuity as it is normally measured, the average being slightly less than two lines on the chart. This is approximately the same improvement as reported from Baltimore[9] and St. Louis.[10] As one would suspect, nearly all the subjects felt that they benefited from treatment. However, none of the subjects had any improvement in their myopia.

A great many ophthalmologists believe that the answer to adolescent myopia is full correction. The basic reason for full correction is that with full correction, accommodation and convergence may be more properly related to each other. For example, an emmetropic subject with a 60 mm. interpupillary distance requires 2.50 D. accommodation and 15 prism diopters of convergence to observe binocularly an object at 40 cms. from his eyes. Now if the subject has 1.50 D. of uncorrected myopia, he will use only 1.00 D. of accommodation with 15 prism diopters of convergence. The only way in which the normal relationship may be established is to correct the myopia with a —1.50 D. sphere. Jackson[11] has published the results of such procedure in 77 cases. The average age when first seen was 16 and when these same patients were seen for the second time the average age was 25. His results are shown below:

Number of Eyes	No Change	Increase less than 1.00 D.	Increase more than 1.00 D.	Decrease
154	44	52	31	27

These results are just as good and perhaps better than the results of any other method of treating.

As far as methods of treatment are concerned, the results would indicate that there are a few cases of pseudo-myopia which are functional, but the weight of all the evidence favors a non-functional basis for myopia as a whole. The logical conclusion is that it should be treated as any other anomaly of refraction: careful examination coupled with logical analysis of all the data.

In the past 10 years I have had two pre-presbyopic subjects, who

through accidental means, have suffered complete paralysis of the IIIrd nerve to one eye. One of these subjects had myopia to the extent of 2.25 D. in each eye. After the accident, the refractive error remained the same. The other subject was hypermetropic. After the accident, the hypermetropia increased 0.75 D. on the injured side. This was probably due to loss of tonus on this side. The fact that the myopic subject showed no such tonic condition would indicate that the tonus was reduced to a minimum in his eyes to maintain distinct vision since at all times a minimum concave lens had been worn by this subject.

For several years now experiments have been conducted in the Division of Physiology of the University of California to determine the exact nervous control of accommodation. The general conclusions that we have drawn are that in a certain sense accommodation occurs as a result of reciprocal innervation, the parasympathetic increasing the refractive power of the eye, while the sympathetic when stimulated maximally decreases the refractive power. However, the mode of action of the two systems varies, the parasympathetic acting through the ciliary muscle while the sympathetic acts by controlling the vascular bed. Thus in normal reflex action the sympathetic cannot be considered to take part in the act of accommodation.

This means that if functional errors do occur they must of necessity be mediated via the parasympathetic or IIIrd nerve. The action of the IIIrd nerve may be inhibited by the use of cycloplegics. This means that functional errors could be revealed by complete cycloplegia; that is, atropine used over several days. As a rule, cycloplegic data approximates non-cycloplegic so closely that more and more ophthalmologists are discontinuing its use for purposes of refraction. At the present time this very point is being investigated by Dr. R. E. Bannon of the Dartmouth Eye Institute; so we may look forward to a complete report on this matter in the near future.

Careful investigations both at the University of California and at Ohio State University have shown that the relationship between accommodation and convergence varies very little from individual to individual. One often hears the statement made that in orthoptic training this relationship can be altered. I have not been able, in a rather complete search of the literature, to discover a single instance in which such an alteration has been made. Dr. Henry Hofstetter has been unable to accomplish this supposedly easy feat and in the three years I have been analyzing the orthoptic data at the University of California no such change has been uncovered.

If accommodation and convergence have a more or less fixed relationship to each other, functional myopia of the progressive type should be characterized by an ever increasing esophoria. Since these phorias do not increase with any great frequency such functional disturbances must be rare.

To sum up: none of the evidence offered by optometric measurements, by Ogle, Tron, Goldman and Hagan, Stenström, by the optometric treatment of myopia, or by the evidence of physiology afford any comfort to those who propose that ametropia is a functional derangement of the organism to its environment. The very best evidence we have today indicates that ametropia may be divided into three types: axial, refractive, and mixed. Of all these types of ametropia by far the most prevalent is axial as indicated by the work of Stenström, the best to date.

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ANALYSIS OF SUCCESSFUL AND FAILURE ANISEIKONIC CASES*

A STUDY OF THE DATA IN 200 CASES

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In the literature there are frequent references to therapies which result in the *relief* of symptoms. However, it is not often that one sees reports which are concerned with the *failure* of certain techniques to effect relief of symptoms.

The difference between patients who may be termed "successful cases" and those who are "failure cases" is, first of all, that the former group report that their symptoms have been relieved and the latter group maintain that their symptoms persist. This difference in the subjective appraisal of one's comfort cannot be overlooked. It is, in fact, the keystone of the whole patient-doctor relationship.

There are practitioners who prefer to state the patient's trouble solely in objective terms; for example, the patient has compound hyperopic astigmatism, exophoria and convergence insufficiency. The correction of these anomalies presumably corrects the patient's trouble. However, the patient as a person does not identify his trouble as "compound hyperopic astigmatism, exophoria and convergence insufficiency," but, rather, as some form of somatic discomfort, such as eye fatigue and headaches. The patient consults the eye specialist because of his somatic discomfort and his judgment of whether or not his trouble is corrected is based upon subsequent relief from discomfort rather than upon the assurance that his "compound hyperopic astigmatism, etc." has been corrected.

While there are fairly clear-cut objective signs by which the experienced practitioner can judge that the patient should, or should not, have the trouble of which he complains, nevertheless, we are all aware that these objective signs are not infallible. We have all seen patients with three or four diopters hyperopia who maintain they have very few

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symptoms and wear their glasses only occasionally. On the other hand, we are all familiar with those patients who have only one or two diopters of hyperopia but who have severe discomfort if they do not wear their glasses constantly.

Everyone has had the experience of treating patients who profess the most severe symptoms and yet report relief from but a slight change in their prescriptions. However, there are other patients for whom everything possible seems to have been done but whose symptoms are not relieved. In those cases where relief of symptoms is not obtained it is common to assume that the lack of relief is due to innumerable factors such as age, sex, dominance, motility anomalies, anisometropia, aniseikonia, and the all too frequent assumption that the patient is neurotic.

Although practitioners are not hesitant to explain away the failure of obtaining relief in certain patients, there has been little, if any, attempt made to determine if the same factors which are used to account for failure are not just as prominent in the successful cases. For example, the hypothesis that crossed dominance accounts for lack of relief can only be justified if this condition occurs more frequently in failure cases as compared to successful cases. Likewise, that psychological factors explain the lack of relief from symptoms can be substantiated only if such factors are more frequently operative in the failure group of patients than in the successful group of patients.

In an effort to ascertain what factors are peculiar to those patients who do not get relief from their symptoms despite the careful correction of their ocular anomalies, we have studied the records of 100 such cases and compared the data with those found in 100 cases in which relief from symptoms was obtained. For the sake of brevity in this paper and in the accompanying tables, we will refer to those patients who did not obtain relief from their symptoms as the "failure cases" or the "failure group;" likewise, those patients who did obtain relief from their symptoms will be designated as the "successful cases" or the "successful group."

The 100 cases comprising the "failure group" and the 100 cases in the "successful group" were selected at random from the returned questionnaires sent to 915 patients for whom aniseikonic corrections had been prescribed and worn for at least one year. These questionnaires, the results of which have been published[1] previously, consisted simply of a request for the following information:

QUESTIONNAIRE

"1. Are you now wearing your aniseikonic correction?

2. To what extent have these glasses helped you? Check one of the following: completely . . . . . ; partially . . . . . ; not at all . . . . . .
3. If you discarded your aniseikonic glasses, please give the approximate date . . . . . and reasons for doing so."

It was not necessary, therefore, to make any assumptions relative to whether or not our patients obtained relief. The patients' written words alone were considered as the basis for placing them either in the "failure" or "successful" category. In order to compare the various factors present in 100 "failure cases" and in 100 "successful cases," the records of the 200 cases were examined carefully for the following data:

1. Patient's age.
2. Patient's sex.
3. Chief symptoms.
4. Differences between previous corrections and new refractive findings.
5. Types of refractive corrections.
6. Motility findings (phorias, fusional amplitudes, convergence, stereopsis, etc.).
7. Dominance (manual and ocular).
8. Aniseikonia and anisometropia.
9. Types of aniseikonia (meridional, overall).
10. Statements made by patient during the examinations, in correspondence, and on the returned questionnaire, from which an evaluation of the patient's psychological pattern could be attempted.

The above information afforded an opportunity to determine what factors are more consistently present, or associated with, the "failure group" as compared to the "successful group." These will be taken up in order.

1. AGE

Table I shows the distribution of age in the "failure" and in the "successful" groups. It is interesting to note in Table I that there are twice as many young people (ages 10 and 30) in the "successful group" as compared to the "failure group." In both groups the number of middle-aged people (ages 30 to 50) are practically the same. In the oldest group (ages 50 and over) there are 70 per cent more in the 'failure group" than in the "successful group."

TABLE I

DISTRIBUTION OF AGES

Ages in Years	No. of Cases in the Successful Group	No. of Cases in the Failure Group
Ages 10 to 20	19	9
Ages 20 to 30	17	9
Ages 30 to 40	27	26
Ages 40 to 50	15	18
Ages 50 to 60	17	23
Ages 60 and over	5	15
Total No. of Cases	100	100

2. SEX

The distribution of males and females in the "successful group" and in the "failure group" (See Table II) does not show any significant differences, although there are slightly more males in the "successful group" and slightly more females in the "failure group." Altogether there were 118 males in both groups and 64, or 54 per cent, were in the "successful" category. There was a total of 82 females and 36, or 44 per cent, were "successful cases." This difference of only 10 per cent in the distribution of sex in this study is not significant.

TABLE II

DISTRIBUTION OF SEX

	No. of Cases in the Successful Group	No. of Cases in the Failure Group	
Male	64	54	=(118)
Female	36	46	=(82)
Total No. of Cases	100	100	

3. SYMPTOMS

The patients generally had symptoms similar to those which bring all patients to the eye specialists. The only difference in this study lies in the fact that the symptoms of our patients persisted after the usual refractive and/or motility treatments had been given, so that the examination for aniseikonia was recommended as a further possibility toward obtaining relief. As pointed out previously,[1] the chief symptoms of patients who were referred for aniseikonic examinations are those of *local* ocular discomfort which may be grouped under the heading of asthenopia and those of *referred* discomfort, mainly headaches. Of course, these patients had also secondary symptoms such as photophobia, nau-

sea, nervousness, vertigo, general physical fatigue, etc., but on the whole the two main symptoms were those of asthenopia and headaches.

In an effort to determine whether or not the chief symptoms of the "successful group" of patients differed significantly from those in the "failure group," the records of the 100 patients comprising each group were studied. For the sake of simplification all local ocular symptoms were classified as asthenopia and the other main classification was that of headaches which may be, and often are, referred symptoms resulting from ocular dysfunction. Thirdly, a few patients had no definite local eye symptoms or any referred symptoms, such as headaches, but were advised to have the aniseikonic examination primarily because of *visual* symptoms such as difficulty in reading. This differentiation of symptoms into the groups of *local, referred,* and *visual* has been proposed by Duke-Elder.[2]

It was thought that a majority of patients in the "successful group" would report asthenopia as their chief complaint, while it was believed that a greater number in the "failure group" would have the more indefinite ocular symptom of headaches. This belief is a common clinical one; that is, it is expected that patients who complain of local eye discomfort (asthenopia) are more apt to be relieved by ocular therapy, whereas, those who complain chiefly of referred symptoms (headaches) may well have factors other than ocular as a basis of their symptoms.

Table III summarizes the distribution of the chief symptoms of the patients in the "successful" and in the "failure" groups. There are no significant differences in the incidence of asthenopia, headaches, or reading difficulty in the two groups. Insofar as this study is concerned, it is obvious that the chief complaint *alone* does not distinguish the possible successful case from the unsuccessful one. However, reference will be made later to other possible factors, involving the appraisal of the patients' symptoms, which may provide a better prognosis.

TABLE III

NATURE OF CHIEF SYMPTOMS

	No. of Cases in the Successful Group	No. of Cases in the Failure Group
Asthenopia	50	51
Headaches	45	42
Reading difficulty	5	7
Total	100	100

4. REFRACTIVE CORRECTIONS

We sought next to establish whether or not the successful outcome of our aniseikonic cases could be due to any change in their refractive or motility corrections in addition to the correction for the image size differences. However, the data, as summarized in Table IV, show that there were about the same number of cases in the "successful group" and in the "failure group" in which the refractive and/or the prismatic corrections of the patients were changed or were not changed. Therefore, we cannot explain on this basis that refractive factors, rather than the aniseikonic correction, accounted for the relief of symptoms in our successful cases.

TABLE IV

CHANGES IN REFRACTIVE OR PRISMATIC ELEMENTS OF PATIENT'S PRESCRIPTION

	No. of Cases in the Successful Group	No. of Cases in the Failure Group
Refractive changes (½ D. or more)	52	57
Prismatic changes (½ Δ or more)	12	11
No change	36	32
Total No. of Cases	100	100

5. TYPES OF REFRACTIVE CORRECTIONS

There are various opinions as to what type of ametropia is most likely to contribute toward discomfort. A study of the distribution of the refractive errors found in the 200 cases under consideration reveals that there is no significant difference in the frequency of one type of ametropia in the "failure group" as compared to the "successful group." Part A of Table V presents the comparison of the various types of refractive error found in the two groups. One point which does have some significance, indicated in Part B of Table V, is that the number

TABLE V

TYPES OF REFRACTIVE ERRORS

	No. of Cases in the Successful Group	No. of Cases in the Failure Group
Part A.		
Hyperopia	8	16
Hyperopic astigmatism	7	8
Compound hyperopic astigmatism	41	43
Myopia	6	5
Myopic astigmatism	6	6
Compound myopic astigmatism	24	12
Mixed astigmatism	8	10
Total No. of Cases	100	100

Part B.		
Isometropia (within 0.50 D.)	32	48
Anisometropia: 0.50 to 1.00 D.	35	33
1.00 to 2.00 D.	23	15
2.00 to 3.00 D.	6	2
3.00 to 4.00 D.	4	2
Total No. of Cases	100	100
Part C.		
Oblique astigmatism (limits 0.50 D., 10° or more from horizontal or vertical)	47	42

of isometropic cases in the "failure group" is 50 per cent greater than in the "successful group." Furthermore, there are more cases in the "successful group" having a greater amount of anisometropia than there are in the "failure group." This is in keeping with clinical experience. Part C of Table V summarizes the incidence of astigmatism at oblique axes in the two groups and indicates that astigmatism at oblique axes occurred no more frequently in one group than in the other.

6. MOTILITIES

The study of the motility data in the two groups of patients afforded significant results. The criteria used in determining that a case should be classed as "normal," with respect to motility were:

(a) Lateral phoria for distance between 2△ esophoria and 2△ exophoria.

(b) Lateral phoria for near (16″) between 2△ exophoria and 6△ exophoria.

(c) Vertical phoria less than 1△ for distance and/or near.

(d) Fusional amplitudes, both distance and near, having the relationship considered normal by Sheard[8] in his paper "Zones of Ocular Comfort."

The cases whose phoria and/or amplitudes were outside the above limits were classed as "abnormal."

TABLE VI

ANALYSIS OF MOTILITY DATA

	No. of Cases in the Successful Group	No. of Cases in the Failure Group
Normal phorias and/or amplitudes	80	45
Abnormal phorias and/or amplitudes	20	55
Total No. of Cases	100	100

Table VI shows that there were nearly twice as many patients in the "successful group" who had *normal* phorias and/or fusional amplitudes; while, in the "failure group" there were more than twice as many with *abnormal* phorias and/or fusional amplitudes. The importance of this information will be better appreciated when it is compared with other data to be discussed later.

7. DOMINANCE

Much has been written on the importance of dominance in the analysis and treatment of ocular anomalies. Mixed hand and eye dominance are supposed to induce certain ocular difficulties, for example, individual cases of ocular inefficiency and discomfort have been associated with mixed dominance. However, there are many cases of mixed dominance which have no ocular discomfort or inefficiency. These cases are usually overlooked when considering cases which present ocular problems. Fendricks[4] in a study of grade school children showed that there was no significant correlation between dominance and reading ability. Likewise, Imus et al[5] concluded from a study of college students that the distribution of mixed dominance was no greater in poor readers as compared to good readers. Table VII shows that in this study dominance is not a significant factor among those patients who obtained relief as compared to those who did not obtain relief.

TABLE VII

COMPARISON OF DOMINANCE

	No. of Cases in the Successful Group	No. of Cases in the Failure Group
Corresponding hand-eye dominance	47	45
Complete mixed hand-eye dominance	21	22
Partial mixed hand-eye dominance	25	28
Not measured	7	5
Total No. of Cases	100	100

8. ANISEIKONIA AND ANISOMETROPIA

From clinical experience, as well as from a knowledge of physiological optics, one expects certain agreement among the different ocular findings. For instance, esophoria would be expected more often in hyperopic cases than in myopic cases. On the other hand, one expects to find exophoria more frequently associated with myopia rather than with hyperopia. When there is reasonable agreement among the findings in individual cases, the diagnosis and the prognosis can be given

with greater certitude than is possible when the various findings do not agree.

Similarly, aniseikonia would be expected when there are differences in the refractive corrections of the two eyes. The data of the 200 cases in this study were analyzed to determine if the aniseikonia measured agreed with the anisometropia more frequently in the "successful cases" than in the "failure cases." Table VIII presents the results of this study, and it is interesting to note that there are significantly more cases in the "successful group" in which the aniseikonia measured agreed with that expected from the anisometropia. In both the "successful group" and in the "failure group," there are about an equal number of cases in which the measured aniseikonia agreed with that expected in one meridian but not in the other. In the "failure group" nearly 75 per cent more cases were found in which the measured aniseikonia did not agree with that expected from the anisometropia than in the "successful group."

These figures indicate that the majority of patients who have been made more comfortable show an aniseikonia which one would reasonably expect from the anisometropia, and, vice versa, these figures suggest that the majority of patients who did not obtain relief, had an aniseikonia contrary to that indicated from the anisometropia. As is true in other instances, viz., the agreement between motility and refractive findings, so also in the case of aniseikonia, a much better diagnosis and prognosis can be given when the measured image size differences correlate with the anisometropia.

TABLE VIII

ANALYSIS OF ANISEIKONIA MEASURED COMPARED TO THAT EXPECTED ON THE BASIS OF THE ANISOMETROPIA

	No. of Cases in the Successful Group	No. of Cases in the Failure Group
Aniseikonia measured agrees* with that expected from the anisometropia	44	25
Aniseikonia measured agrees* partially,** but not completely, with that expected from the anisometropia	29	28
Aniseikonia measured does not agree* with that expected from the anisometropia	27	47
Total	100	100

*within clinical limits (± ½%).
**agreement in one meridian, but not in the other.

9. TYPES OF ANISEIKONIA

The distribution of the various types and amount of aniseikonia

in the "successful group" and in the "failure group" is shown in Table IX. It is evident that the bulk of the cases in both groups have an aniseikonia 0.50 per cent and 2.00 per cent. The number of meridional corrections in the "successful group" exceeds that in the "failure group" by 50 per cent. On the other hand, the number of overall corrections in the "failure group" exceeds that in the "successful group" by only 20 per cent. These differences may be significant.

TABLE IX

TYPES OF ANISEIKONIA

	No. of Cases in the Successful Group		No. of Cases in the Failure Group	
Overall:				
0.50% to 1.00%	28		40	
1.00% to 2.00%	20		19	
2.00% to 3.00%	2		3	
3.00% to 4.00%	1		0	
Over 4.00%	0	(51)	1	(63)
Meridional:				
0.50% to 1.00%	14		16	
1.00% to 2.00%	24		9	
2.00% to 3.00%	1		1	
3.00% to 4.00%	0	(39)	0	(26)
Overall ⊂ Meridional:				
0.50% to 1.00%	1		0	
1.00% to 2.00%	7		7	
2.00% to 3.00%	1		2	
3.00% to 4.00%	1	(10)	2	(11)
Total No. of Cases	100		100	

10. PSYCHO-PHYSIOLOGICAL FACTORS

Finally, an effort was made to determine if psycho-physiological factors peculiar to the patients studied were markedly different in the "successful group" as compared to the "failure group." Such data as the patient's age, sex, chief complaints, refractive error, motility anomaly, aniseikonia, etc., enable the eye specialist to make a fairly good diagnosis and prognosis. However, these data do not comprise the total patient as a person. Everyone is aware that various personal idiosyncrasies, difficult to define but which are peculiar to all patients, frequently have an effect on the ultimate outcome of the case. Clinical experience teaches one to estimate the degree of discomfort commensurate with various ocular anomalies. For instance, the uncorrected 2 D. myope may well complain of blurred distant vision, but we do not expect him to have much discomfort for close work. On the other hand, the uncorrected young

hyperope of 1 or 2 D. who complains of discomfort for driving and the movies, but not for long periods of reading, would be considered unusual.

Patients who report a number and variety of symptoms which cannot be reconciled with their ocular anomalies may have some physical and/or psychological deficiencies which have escaped detection or have been ignored. In such cases, the eye specialist is justified in assuming that the patient's complaints may have a neurotic basis provided, of course, that thorough physical and neurological examinations are negative. It is also possible that neurotic patients may report relief of their symptoms by some picayune therapy or placebo. Patients who report remarkable comfort following an insignificant change in the refractive, or any other, correction may be considered neurotic as well as those who do not report relief following the correction of all anomalies detectable.

Bartley[6] has pointed out that many symptoms which are generally classified as fatigue may well be due to the psychosomatic factors of conflict and frustration in the personal life of the individual. Ocular corrections will not change the home, social, or business environment of our patients. If their symptoms are based upon unhappy or unsatisfactory social, marital, or business factors, there can be little hope of remedying these conditions by ocular corrections.

Lawrence Post[7] has recently stated that he has been impressed with the neurotic characteristics of a great number of the patients who are referred for aniseikonic examinations. He suggests that the relief many patients obtain presumably from aniseikonic corrections may well be due to the psychiatric character of the patients. Of course, it is not difficult to understand how the patients who are referred for aniseikonic examination may well be susceptible to more neurotic tendencies than the average patient. As Post[8] stated in an earlier paper:

> ". . . the aniseikonic clinics have become the rendezvous of the most difficult patients for whom to obtain comfort."

It is clear that patients are advised usually to have the examination for aniseikonia only as a last resort, since other examinations and treatments had failed to bring relief. It is no wonder that these patients who have had long-standing symptoms and many different (often conflicting) diagnoses approach the aniseikonic examination under conditions which are certainly favorable for the exploitation of psychoneurosis.

However, it should be realized that psychoneurosis is not peculiar to aniseikonic patients only, but is quite common in routine ophthalmic practice. Bahn[9] states that in a series of 400 consecutive office patients a psychoneurotic factor existed in 301 cases. He estimated that the per-

centage of psychoneurotic cases in ophthalmic practice is 75 per cent compared to 50 per cent in general practice.

In an effort to determine the psycho-physiological pattern of the "successful" and "failure" groups under consideration, the records of the 200 patients were studied independently by four professional people* and a composite evaluation made for each case. (See Table X). The difficulties of judging whether or not the patients presented normal or abnormal psychological characteristics were fully appreciated. In general, the classifications were decided upon by judging whether the patients' symptoms, histories, and personal idiosyncrasies were (or were not) commensurate with the ocular findings and the degree of relief obtained.

It is interesting and significant to note in the "successful group" that 87 per cent were judged to be normal, and 9 per cent judged to be abnormal, psychologically. Among those who reported no relief (failure group), 48 per cent were judged to be normal, and 46 per cent abnormal, psychologically.

TABLE X

PSYCHO-PHYSIOLOGICAL APPRAISAL

	No. of Cases in the Successful Group	No. of Cases in the Failure Group
Normal (Symptoms commensurate with ocular findings)	87	48
Abnormal (Symptoms not commensurate with ocular findings)	9	46
Borderline Cases	4	6
Total	100	100

SUMMARY

This study was undertaken to test the validity of certain assumptions which are commonly made in clinical practice relative to the relief

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that patients report from certain corrections being an indication of the efficacy of the therapy given and, on the other hand, to evaluate the various and sundry reasons given for lack of relief.

A group of 100 cases were selected at random in which relief from symptoms had been reported and the data on these cases were compared with that from an equal number of cases which had been examined and treated in a similar manner but yet had experienced no relief from symptoms. These two groups were designated as the "successful group" and the "failure group." Ten salient features of the two groups were compared and are presented in tabulated form.

Table XI presents a summary of all factors considered. It was found that the distribution of ages may have some significance as one would expect. The younger people were more numerous in the "successful group" and the elderly people more predominant in the "failure group."

With respect to sex, there were only slightly more females in the "failure group" and a few more males in the "successful group." However, the distribution is not very significant.

The patients' chief complaint, when this factor is considered alone, did not offer any pertinent information insofar as its greater frequency in the "successful" or the "failure" group. Limiting the evaluation of the patients' problems to only *one* chief symptom does not seem to be particularly helpful in the prognosis.

Those patients who were referred for an aniseikonic examination had not been helped adequately by refractive and/or motility corrections alone. Although the refractive and/or motility corrections of some patients were changed slightly together with an aniseikonic correction, nevertheless, it was found that the "successful cases" could not be accounted for on the basis of changes in the basic refractive and/or motility corrections because just as many corrections were changed, or were not changed, in the "failure group" as in the "successful group."

With respect to the different types of refractive errors, there were more anisometropic cases in the "successful group" and more isometropic cases in the "failure group." This is as one would expect and indicates that aniseikonia is due to dioptric factors in the majority of cases.

Significantly more normal motility cases were found in the "successful group" and, vice versa, a preponderantly greater number of abnormal motility cases were present in the "failure group." This might be expected because binocular anomalies such as heterophoria, poor fusional amplitudes, and aniseikonia are definitely related as has been shown previously. [10, 11]

TABLE XI

Summary of Data

Tables	*Results*
I. *Ages*	More young in "successful group." Middle-aged equally divided. More elderly in "failure group."
II. *Sex*	No significant correlation.
III. *Chief symptoms*	No significant correlation.
IV. *Changes in refraction and/or prisms*	No significant correlation.
V. *Types of refractive error*	More anisometropic cases in the "successful" group. More isometropic cases in the "failure group."
VI. *Motility*	More normal motility cases in "successful group." More abnormal motility cases in "failure group."
VII. *Dominance*	No significant correlation.
VIII. *Agreement between measured and expected aniseikonia*	More cases in "successful group" had aniseikonia as expected from the anisometropia. More cases in "failure group" had aniseikonia contrary to that expected from the anisometropia.
IX. *Types of aniseikonia*	More meridional corrections in the "successful group."
X. *Psycho-physiological appraisal*	Greater number of normals in the "successful group." Greater number of abnormals in the "failure group."

Dominance apparently plays no part in ocular discomfort. There was not a significantly greater distribution of mixed dominance in either the "successful group" as compared to the "failure group."

There is some definite diagnostic and prognostic value in the correlation of the patients' anisometropia and aniseikonia measured. When the anisometropia and the aniseikonia agree, more cases were found in the "successful group" and, vice versa, when these two factors differed, the greater number of such cases were present in the "failure group."

Of the two types of aniseikonia, overall and meridional, it was found that there were more meridional cases in the "successful group" than in the "failure group."

Finally, the psycho-physiological evaluation of the patients proved significant. There were a much greater number of patients in the "successful group" whose symptoms could be judged "normal," that is, their symptoms were commensurate with the ocular findings. In the "failure group," a significantly greater number of patients had symptoms which were considered out of proportion to the ocular findings.

This study, therefore, will justify the very tedious work of compiling and comparing the data on the 200 cases considered if it succeeds in stimulating those interested in their patient's welfare to realize what type of case may be more likely to obtain relief from ocular corrections and, vice versa, what type of case presents an unfavorable risk.

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A PRELIMINARY REPORT OF THE CLINICAL USE OF BASE-IN PRISMS TO RELIEVE CERTAIN VISUAL SYMPTOMS*

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In considering this subject let us remember that we must, of necessity, prescribe prisms every time we prescribe lenses, expect when the prescription is for cylinders only, with their axes horizontal.

If the prescription is composed of plus elements and the optical center of each lens placed directly in front of the eyes, we will not have a prismatic element for distance vision but we will have base-out prisms for any near work. Should the optical center of the lenses be inset for the pupillary distance at near, we then are prescribing base-in prisms for distance and no prisms for near work. The amount of prismatic element will vary with the power of the lenses.

If we are prescribing a minus correction the reverse would be true. With the optical centers of the lenses adjusted for the distance pupillary separation we would have a base-in prism for near work. Should the optical centers be placed at the pupillary separation for near work we would be prescribing base-out prisms for distance, the amount of the prism depending on the power of the lenses, either plus or minus.

If the optical centers of the lenses are placed midway between the distance pupillary separation and the near pupillary separation we would be prescribing base-in prisms for distance and base-out prisms for near if the prescription is for convex lenses and the reverse if the prescription is for concave lenses.

As it is impossible to avoid using prisms in every correction except when cylinders of equal power with their axes horizontal are used, it seems wise to make an effort to prescribe these prisms intelligently to the ultimate benefit of our patients.

In 1928, through the good offices of Dr. R. M. Peckham, the writer became interested in the use of base-in prisms as a relief for certain visual disturbances.

Peckham contended that in addition to relief from certain symp-

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toms, base-in prisms would, in some cases, reduce the amount of manifest myopia or increase the manifest hyperopia. For some time Peckham determined the strength of the base-in prisms to be used, by a study of the phorias, blur points and ductions. Later he advocated the procedure of placing base-in prisms empirically before the eyes, then building up sufficient minus (for a myope) to give the desired visual acuity binocularly.

The writer followed Peckham's teachings for years and found that in some cases his procedures resulted in comfort and efficiency while in others the patient could not wear the correction with comfort. All prism corrections were prescribed for patients who could not obtain comfort and efficiency through wearing the required spheres and cylinders and who either could not or would not make regular visits to the office for visual training to improve fixation ability, phorias, blur points and ductions. Following this procedure, the writer used base-in prisms in 15 to 30 cases each year from 1928 to 1942. Some of these prescriptions relieved the symptoms, some gave no relief, some could not be worn at all. Not enough prisms were used to determine when their use was indicated or when not indicated. This procedure was followed until the war caused transportation to be restricted, and also made it impossible to secure sufficient office help to do the required volume of visual training.

It then became necessary to make patients comfortable through the use of glasses alone. This led to a careful study of the cases relieved of their visual discomfort in the past several years through the use of base-in prisms. This study brought out the fact that the patients finding relief through wearing base-in prisms complained of one or more of the following symptoms:

1. Photophobia.
2. Car sickness.
3. Crowd headaches.
4. Movie discomfort or headaches.
5. Discomfort when doing close work.
6. Holding reading material or close work too near the eyes and in many cases bringing reading closer and closer after the reading period lengthened.
7. Pain at the base of the brain.

Some of the patients were esophores, some exophores. With some the blur points and ductions fell within Percival's Zone of Comfort,

some did not. Some had high dynamic skiametry lags, some low. Some had high cross cylinder lags, some low.

Altogether, the 100 cases studied could not be classified through the use of any of the routine optometric procedures. However, each complained of one or more of the foregoing symptoms.

The failures, it appeared, were in those cases where too much consideration was given to phorias, blur points, ductions, etc.

During the year of 1944, the writer prescribed base-in prisms for 50 patients reaching conclusions as to the amount required through considering the aforementioned symptoms and combining with them the following commonly-used criteria:

1. Fixation ability.
2. The push-up test.
3. Phorias, blur points and ductions for distance and near.
4. Binocular cross cylinder lag.
5. Monocular cross cylinder lag.

The results were successful in most of the cases.

In the year of 1945, transportation became still more difficult and office help more scarce. In that year the writer prescribed base-in prisms for 99 patients, continuing the same procedure used through 1944, except that the writer found himself depending more and more upon symptoms instead of mechanical response.

In January, 1946, the writer made a complete study of 141 of the cases given base-in prisms during the two-year period to ascertain the criteria necessary for prescribing base-in prisms. The results will be found in Tables 1 and 2.

Fixation Ability		Blur Points and Ductions	
Defective	83	Falling within Percival's Zone of Comfort	78
Accurate	58	Outside Percival's Zone of Comfort	63

Push-up	Number	Diplopia	Single
Break at 3 inches	12	7	5
Break at over 3 inches	87	58	29
Break at under 3 inches	9	6	3
No break	15		
Not taken	18		
Table 1	141		

Of these 141 cases who received prismatic prescriptions in the years 1944 and 1945, five did not obtain the expected relief and must be considered as failures.

While I have given the statistics covering the two-year period, the writer made a practice of studying every two or three months the cases

Phorias	
Normal distance—Ortho near—6 Exophoria	12
High exophoria	47
Low exophoria	8
Esophoria	6
Mixed	31
Not taken	37
	141

Binocular Cross Cylinder Lag	
Normal—+50 to +75	34
High lag	20
Low lag	49
Minus	24
Not taken	14
	141

Monocular Cross Cylinder	
Greater lag than binocular	83
Some lag found in binocular	30
Less but still plus	3
More minus than subjective	5
Not taken	20
	141

Table 2

in which base-in prisms were used to make sure that we were using the proper criteria for arriving at our prescription and to make sure that these corrections were actually responsible for the results obtained.

At the beginning of 1946, the writer came to the conclusion that consideration of phorias, blur points and ductions was only misleading and that the diagnosis and findings must be made from the previously mentioned symptoms and the following patient responses:

1. After arriving at the most critical subjective finding for each eye, the patient was asked if binocular vision was instantly clearer than monocular vision, or if perceptible time elapsed before binocular vision became clearer than monocular vision. If the patient answered that it did require perceptible time for binocular vision to become clearer, the writer then ascertained whether there were vertical imbalances by creating diplopia and ascertaining if the two images were level. If the two images were not level, they were brought in balance with vertical prisms and the patient again asked whether binocular vision was instantly clearer than monocular vision. If the vertical prisms resulted in binocular vision becoming clearer instantly, these were prescribed.

2. After correcting the vertical imbalances without the result of instant binocular improvement in vision, a 1△ base-in was placed before one eye. If the response to this was added clearness of vision, a 1△ base-in was placed before the other eye. If this resulted in improvement of vision, the next step, was taken.

3. The base-in prisms were removed and the patient asked if there was a blurring followed by a clearing of the distance chart, or if there

was a feeling of "pull" on the eyes when the prisms were removed. If the patient answered that there was a blurring, followed by a clearing, or a "pulling" feeling, he was told that a prescription of spheres and cylinders would give a certain measure of relief but that including prisms in the prescription would give added relief.

The patient's chair was then turned to face the wall, and the writer demonstrated the distortion of the base-in prisms. Attention was called to the convex curving of the wall and the fact that the floor would appear to be raised. The patient was assured that if he wore his glasses constantly the prism distortion would disappear within a few hours or a few days, but if he did not wear them at all times, the distortion would continue.

If the patient promised to wear the correction constantly and come back for a check up, prisms were prescribed. If the patient thought it might be necessary to go without his glasses part of each day prisms were not prescribed.

For the year 1946, the writer prescribed base-in prisms for all patients complaining of one or more of the listed symptoms and for those who showed a willingness to co-operate, without first attempting to relieve their symptoms with simple spheres and cylinders. A total of 220 patients were prescribed base-in prisms in 1946. At this writing, April 1, 1947, 219 have returned for post refractions. Of these, 211 are still wearing their prismatic corrections with comfort. One patient could not use the prisms, and in eight patients convergence has so increased as to justify the removal of the prisms.

The questions now arising are:

1. *Will the patient continue to need more and more base-in prism as contended by some writers?*

Considering the occasional base-in prisms prescribed from 1928 until 1944 and the more numerous prescriptions since that time the writer has not encountered a case where there was a progressive demand for increased powers of base-in prisms.

2. *Does the wearing of base-in prisms result in a reduction in manifest myopia or an increase in manifest hyperopia?*

In a very few cases this result has been obtained but these cases are rare indeed.

3. *Once worn can base-in prisms be dispensed with?*

In some cases the wearing of base-in prisms builds up convergence ability to such a point that the patient is able to achieve visual efficiency

and comfort without the prisms. In the few cases where the manifest myopia has been reduced or where the manifest hyperopia has been increased base-in prisms are no longer required for comfort and efficiency.

4. *Does the elimination of the symptoms with base-in prisms result in increased efficiency in terms of reading speed and comprehension?*

The writer has not been able to make a careful study of a sufficient number of cases to give a reliable answer. Of the few cases studied there has been some improvement in comprehension but there has been no significent increase in reading speed. School work has apparently been made easier in most cases because the students were able to read with comfort for a greater length of time and concentrate more fully on the material being studied.

5. *How high a percentage of the patients benefit from wearing base-in prisms?*

The writer finds in his own practice that a substantial proportion of his patients require base-in prisms. This may or may not represent a true picture of the visual functioning of people in this locality. Many patients come in wearing spheres and cylinders which have failed to relieve their symptoms, so there is a possibility that the relief reported by their friends has caused them to consult the writer with the result that temporarily the substantial proportion of all present patients do require base-in prisms.

There seems to be a family visual pattern, perhaps the result of inheritance, or perhaps family dietary habits, which result in a lessened stimulus to convergence function. In the different branches of one family alone 13 pair of base-in prisms have been prescribed in the past year. The first member receiving relief from his visual problems, not previously experienced through the use of spheres and cylinders, referring the other members of the family.

There is some evidence that the dietary habits of certain communities, the type of soil or the water supply may result in an insufficient stimulus of convergence since our records show that a higher proportion of patients from these communities require base-in prisms for visual comfort.

The writer's investigation of visual functioning for near in terms of reading speed and comprehension brought out the great difference in the visual functioning of school children in the four localities in which our research was conducted, namely, the University of Nebraska, the

Ord City schools, Claremont college in southern California and the Boulder public schools at Boulder, Colorado. Not only was there a great difference in the original visual performance as shown by photography but there was a wide difference in the results of using the same routine of visual training under controlled conditions in the different communities. This brings up the yet unanswered question as to whether like results can be obtained in the different sections of the country through the use of base-in prisms?

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PROFESSIONAL ETHICS

The subject of professional ethics is so vast and inexhaustible, and the space so limited, that if I can succeed during the next few pages in at least telling you what it is that I want to talk to you about we will have made much more progress than is usually made in a discussion of my subject.[1]

Ethics is concerned with universal principles of conduct. Most people get along quite well with vague ideas about what the philosophers would call universals, that is, all-inclusive general principles. They are

[1]An abridgment of the material presented by Dr. Eugene Freeman, of Chicago, Illinois, at the Annual Banquet of the American Academy of Optometry at Philadelphia, Pennsylvania, May 19, 1947.

guided by them successfully in their practical everyday affairs, but when faced with the task of putting into words a statement of the meaning and scope of these principles, they are very much like the small boy who was asked by his teacher to define the word vacuum, and who replied that he knew that he had it in his head but he just couldn't express it.

As you know, ethics is a branch of philosophy, and philosophy is not a body of dogmatic teachings, but on the contrary, a technique of investigating general principles—a technique of searching, questioning, probing, criticizing, evaluating—not just one aspect or point of view, but every possible point of view, including those of our opponents as well as our own.

The world has often amused itself by making fun of philosophers. One famous writer said that "A philosopher is like a blind man in a dark cellar looking for a black cat that isn't there". Another favorite conception of the philosopher, which comes from his annoying habit of changing sides and arguing the case for his opponent just as enthusiastically as he argues his own, is to liken him to Buridan's ass, who starved to death when he was placed midway between two equally attractive bales of hay. The work of the philosopher has been considered to be idle and empty, with no practical significance for our everyday lives. Yet there is not the faintest doubt that the first and second world wars were the direct and inevitable outcome of a distortion of the philosophical teachings of the eighteenth century German philosophers Fichte, Schelling, and Hegel, together with those of their successors Schopenhauer and Nietzche—or that the political structure of modern Russia could have come anywhere but from the distortion of the teachings of Carl Marx and Engels in the nineteenth century, and Lenin and Trotsky in the twentieth.

Professional ethics is a sub-division of social and political philosophy, and the detailed structure of the content of professional ethics inevitably reflects the social and political philosophy of a particular kind of culture in which it is found. Thousands of years of the history of civilization, of sociology, of politics, of logic and morals, are all deeply rooted in the present day meaning of the term "professional ethics." In our twentieth century western Christian culture, our concepts of Professional Ethics are based on a lofty humanitarian acceptance of the moral responsibilities to the rest of our society, of the vocational groups we call professions. But they are equally, and in practice, frequently even more so, concerned with the protection of the interests and well being of the individual members of the professions.

Every nation, every state, every unified social or vocational group must have a government if it is to have an identity as a group. The code of ethics of a profession is the body of self imposed laws which gives a profession its identity as a group, and permits it to govern itself as a rational and responsible entity.

In the April 1947 issue of FORTUNE magazine, there is a reprint of a report entitled "A Free and Responsible Press" written by a commission of thirteen distinguished American intellectual leaders*, whose members were selected by Robert Hutchins, the chairman of the commission. On page 15 and 16 of this report there is a section on professionalization which sums up the most fundamental meaning of professionalism in a few concise statements, which are worth quoting in full, not only because of the authority with which these men speak, but because their brief summary brings us to the innermost essence of what is meant by the term profession today, to men who are not optometrists or physicians or dentists.

> "A profession is a group organized to perform a public service. There is usually a confidential relation to the recipient of the service, one of advice, guidance, and expert assistance, which makes the rule of 'caveat emptor' peculiarly inappropriate. And there is an 'esprit de corps' resting, among other things, on a common training and centering in the maintenance of standards. In theory, at least, the group seeks to perform its service and to maintain the standards of the service even though more money could be made in ways that would endanger or sacrifice the confidential relation and the quality of the work. The code of the legal profession has almost the force of law; unless the courts rule that the Bar Association was wrong in a particular instance, a man found guilty by the bar of violating the ethical code of lawyers will not be permitted to continue to earn his living by practicing the profession. The medical profession has almost the same control over its members.

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"No public service is more important than the service of communications. But the element of personal responsibility, which is of the essence of the organization of such professions as law and medicine, is missing in communications. Here the writer works for an employer, and the employer, not the writer, takes the responsibility. In the mass media, except at the higher levels of writing, the identity of the individual writer's product tends to be merged in a joint result, as in newspapers, where it is divided among reporter, copy desk, and makeup desk. The effective organization of writers on professional lines is therefore almost impossible.

"But if professional organization is not to be looked for, professional ideals and attitudes may still be demanded. Those ideals and attitudes in the professions of law, medicine, and divinity are cultivated by the professional school of those disciplines. They act as independent centers of criticism. The better they are, the more independent and the more critical they are. The schools of journalism have not yet accepted this obligation. With few exceptions they fall short of professional standards. Most of them devote themselves to vocational training, and even here they are not so effective as they should be. The kind of training a journalist needs most today is not training in the tricks and machinery of the trade. If he is to be a competent judge of public affairs, he needs the broadest and most liberal education. The schools of journalism as a whole have not yet successfully worked out the method by which their students may acquire this education.

"The individual responsibility of the owner or manager of any unit of the press will always be inescapable and great. That responsibility is to his conscience and the common good. Lawyers and doctors have a similar responsibility—their conscience has been in some degree institutionalized. The profession, as such, has a conscience. That is what makes it a profession. The difficulties in the way of the formal organization of the press into a profession are perhaps insurmountable. But, keeping in mind the inescapable individual responsibility, society should see to it that every effort is made to develop a more institutionalized or communal responsibility."

We can now summarize more freely the most significant statements and implications of this report.

1. A profession is a group organized to perform a public service.

2. The professional man must be *trustworthy*, because (a) his relationships to his client are confidential and (b) his client does not have the skill or knowledge to critically evaluate his *methods*, which must be accepted on trust, regardless of whether the results they bring are successful or unsuccessful. Therefore the rule of *caveat emptor* does not apply.

3. The profession has a group personality, resting on (a) common training and (b) *centering* in the maintenance of standards.

4. In the professions, there is a high order of personal responsibility and personal conscience, but there is also a group responsibility and a group conscience, and according to Hutchens *et al*, it is the institutionalizing of the group responsibility and conscience which makes of a vocation a profession.

5. Professional men, as a group, in theory at least, maintain the quality and integrity of their services even though *they earn less money* than they could earn if they lowered their standards of practice.

6. In a well organized profession such as medicine or law, a strict control, with virtually the force of law, is exerted over the membership by the "code of ethics" of the association; and is a powerful factor in creating a strongly unified group personality and responsibility and conscience.

7. The element of personal responsibility is essential in the organization of a profession, and this factor is missing in those vocations where services are performed for an employer rather than a client.

8. The professional schools are the primary source for the cultivation of the ideals and attitudes of the profession. The professional man needs more than training in the tricks and machinery of his trade—he needs the broadest and most liberal education (which he is expected to acquire partly from his pre-professional course and partly from the personal example of his professional teachers).

It was highly gratifying to me to appreciate how closely the foregoing disinterested and authoritative account of what is meant by professionalism accords with the convictions and ideals of the American Academy of Optometry, and how sharply it rebukes, by implication, the practices of those optometrists whose conduct we in the Academy would consider to be unprofessional. It is one of the characteristic marks of genius in literature to have an author say simply and clearly what we have all been thinking and trying to say for years and years, without ever quite expressing it, and I believe we can all agree that in this sense much of the Hutchins' report is truly great writing.

Perhaps the most significant lesson we can learn from the Hutchins' report is that we can not emphasize too strongly how critically important to the very essence of a profession are its group responsibility, its group conscience, its group personality.

Optometry as an organized body has an incoherent and heterogenous personality. Its ranks are so split into incompatible divisions of professional, unprofessional, and semi-professional members that it is difficult for the average patient to classify an optometrist; and when he accepts the optometrist as a professional man he is just as likely to have done so not because of, but in spite of, the optometrist's vocation. The other day I took my three-year old son with me when I went to visit a friend who has a typical jewelry store practice. His store is a small one, and his "optical department," at the rear, is not partitioned off. While we were waiting for the doctor to finish selling a customer some jewelry, Tommy caught sight of the unit and wanted to know what it was. I told him, and then he wanted me to examine his eyes, and in order to keep him quiet I did an ophthalmoscopy on him. We then returned to our seats facing the jewelry counter, and as Tommy looked into the show case, he wanted to know "what do you buy here." I made the mistake of including "watches" in my list and of course he wanted me to buy him one. Fortunately, my friend rang up his sale about then and the cash register diverted Tom's interest. The doctor then quickly dispensed a finished prescription, and Tommy watched the re-check with great absorption, being particularly fascinated by the ringing of the cash register. Now I would be the last person in the world to dispute the fact that Tom is an extremely bright boy, but I was taken completely unawares when, after the doctor and I had finished our brief conversation about a mutual patient, Tom asked me as we were leaving, "Daddy, what is this, an *office store?*"

With office stores, and store-offices, and professional offices, how can the group personality of optometry have any unified significance?

As matters stand today, we have an ever growing number of men who *voluntarily* choose to practice optometry as a profession, and *as individuals*, they are fully accepted as professional men. The body of optometry, however, is not granted full recognition as a profession, and will not be until our codes of ethics are giving the force of law, so that those who refuse to voluntarily practice optometry as a prfession will be deprived of their right to practice it at all.

When the great majority of optometrists choose to practice optometry according to the standards of the Academy, the difficulties of gain-

ing legal status for our ethical codes will not prove to be insuperable. In the meantime, every member of the Academy should make a sustained effort to spread the teachings of the Academy to those of his fellow optometrists who are receptive. State chapters should be encouraged and strengthened, and membership in the Academy, instead of being honorary, should be militant. In the interests of creating a strong and unified group personality, the state chapters should be dependent rather than independent bodies, and no one should be permitted to be a member of a state chapter without at the same time being a member of the parent body.

In conclusion, I have tried to show how a code of professional ethics is implied in the very essence of the meaning of a profession, and I have discussed the Hutchins' report with you to help you to see how important it is for the Academy to continue to be the strongest force in optometry for professionalizing the group personality of optometry; so that we can some day gain our recognition as professional men, not merely as individuals, but as members of a recognized profession.

EUGENE FREEMAN

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

PHILADELPHIA MEETING OF ACADEMY

DR. HAROLD M. FISHER ELECTED PRESIDENT

On May 21, at its 25th annual meeting, the American Academy of Optometry elected Dr. Harold M. Fisher of New York City to serve as its 1947 president.

Dr. Fisher, who has been a Fellow of the Academy since 1935, succeeds Dr. J. Fred Andreae of Baltimore, Maryland, who becomes past president.

Dr. Fisher was born in June, 1905, at Katonah, New York. In 1936, he married Mildred Lewless. He has two children, Mabel Francis, 9, and Barbara Ann, 5. His father, Dr. Willard B. Fisher, still practices optometry at the age of 70, in Katonah.

After finishing high school, Dr. Fisher attended Middlebury College, Middlebury, Vermont, where he received his Bachelor of Science degree. After being graduated from Middlebury, he attended Columbia

University where he received a Certificate of Graduation in Optometry. He then attended Pennsylvania State College of Optometry, and in 1932 the college conferred upon him a Doctor of Optometry degree.

Early in his optometric career, which began in 1932 as assistant to Dr. Franklin Seward of New York City, Dr. Fisher began to specialize in the treatment of aniseikonia, and since has devoted the major portion of his time to the problems of aniseikonic patients.

Dr. Harold M. Fisher

His first work in the aniseikonic field began at the New York Eye and Ear Infirmary in 1934 after completion of a training period in aniseikonia at the Dartmouth Eye Institute, Hanover, New Hampshire.

At the clinic, Dr. Fisher served as a clinical lecturer and taught physiolocial optics.

Dr. Fisher served as the 1946 chairman of the aniseikonic section of the American Academy of Optometry, which was instituted in 1945 at the annual meeting in Columbus, Ohio.

Simultaneously with his affiliation with the New York Eye and Ear Infirmary, Dr. Fisher became an associate of Dr. David H. Pratt of New York City, and has practiced with Dr. Pratt ever since.

As was the experience of many optometrists, Dr. Fisher's practice was interrupted by World War II. He entered the service early in 1942 in a civilian capacity, working on the Princeton project—a research group which devoted its efforts toward improving range finding for antiaircraft batteries. In February, 1943, he was commissioned as a captain in the Coast Artillery where he continued to work in this specialized field. He was honorably discharged in January, 1945.

After returning from service Dr. Fisher resumed practice in New York City and also opened an office in Mt. Kisco, where he resides.

Dr. Fisher is a past president of the New York Academy of Optometry, a member of the New York State Optometric Association, the Optometric Society of the City of New York, and the American Optometric Association. He is also president of the Columbia University Optometric Alumni Association, and a member of Sigma Phi Epsilon. He has served on the Executive Council of the American Academy of Optometry since 1941, and as vice president from 1944 until his election as president. Also active civically, he is a member of the New York Lions' Club, and commander of the Moses Taylor, Jr. American Legion Post No. 136, Department of New York.

In accepting the presidency, Dr. Fisher said, "To me, this represents the highest honor that can come to any optometrist, and I assure you I shall not let this honor rest lightly. I will do my best to promote the highest ethics and give Academy members the best possible programs."

DR. J. FRED ANDREAE, PAST PRESIDENT

Dr. J. Fred Andreae, a member of the Academy since 1926, and an officer since 1927, is now past president of the Academy. From 1927 to 1944, Dr. Andreae served the Academy as its secretary-treasurer, and in 1944 was elected president, an office he held until the meeting in Philadelphia. He will now serve as a member of the Executive Council.

It is unanimously felt among Academy members that Dr. An-

dreae's Academy activities have had much to do with the development of this technical society.

Not only has Dr. Andreae been active in the American Academy of Optometry, but many other optometric organizations as well. He is a past president of the American Optometric Association, and an active participant in the affairs of his state association and the State Board of Examiners in Maryland.

THE MEETING

The "postponed 1946" meeting of the American Academy of Optometry was held in the Bellevue-Stratford Hotel, Philadelphia, Pennsylvania, on May 18, 19, 20 and 21. Registration was slow at first, as many members traveled by plane and were delayed by bad weather, but by Sunday afternoon, the first day of the convention, registration was up to expectations, dispelling fears that last December's postponement might affect attendance.

The sessions took place in the hotel's "South Garden," a large airy room on the top floor of the hotel. As South Garden opened directly onto open-air balconies, Academy members between lectures were able to get an interesting "air" view of Philadelphia, between a curtain of fog which settled over the city intermittently.

Except for one major change, the convention program took place as planned by the program committee. Dr. Galen F. Kintner, Wabash, Indiana, could not appear as scheduled.

A welcome variation from the South Garden sessions was provided Academy members Tuesday, May 20, by the Pennsylvania State College of Optometry. The college chartered busses to transport Academy Fellows to the school, where a pleasant and informative day was spent.

Cameras of all types were in evidence the few minutes the group spent on the campus before going inside for the lectures, and by now many Fellows undoubtedly have a permanent record of the day at Penn State for their optometric scrapbooks.

Four faculty members presented papers, as outlined later. In addition to the lectures, the college arranged a tour through their very outstanding anatomy department, and a luncheon for Academy Fellows which was served at the school.

SECTION SESSIONS

The sections on aniseikonia, contact lenses and orthoptics conducted their sessions as planned, each holding spirited discussion periods relating to these specialties.

CHAPTER REPORTS

Chapter reports were received from the following chapters: Southern California; Vermont-New Hampshire; Iowa; Indiana; Michigan; Eastern Pennsylvania; Cuyahoga (Cleveland, Ohio); as well as a formal application for a charter from the newly formed Columbus chapter.

These chapter reports will be covered in the July issue of this Journal.

THE SPEAKERS

During the four-day session, the following optometrists and educators presented papers which will be published in the Journal during the coming months.

Dr. V. J. Ellerbrock, Columbus, Ohio; Dr. Rudolph T. Textor, Cranford, New Jersey; Dr. Roy Marks, Dayton, Ohio; Dr. Onfrey G. Rybachok, Philadelphia, Pennsylvania; Dr. Harold Simmerman, Woodbury, New Jersey; Dr. Gilda Coppola, Philadelphia, Pennsylvania; Dr. J. Donald Kratz, Philadelphia, Pennsylvania; Dr. J. S. Nupuf, Canton, Ohio; Mr. Fred Jobe, Rochester, New York, and Dr. S. H. Bartley, Hanover, New Hampshire.

Dr. Glenn A. Fry, Columbus, Ohio; Dr. Henry A. Imus, Washington, D. C.; Dr. Charles S. Bridgman, Columbus, Ohio; Dr. Robert E. Bannon, Hanover, New Hampshire; Dr. Eugene Freeman, Chicago, Illinois; Dr. E. J. Margaretten, New York, New York; Dr. M. N. Chodroff, Brooklyn, New York; Dr. H. W. Hofstetter, Columbus, Ohio, and Dr. Mathew Alpern, Cleveland, Ohio.

REPORTS

The opening meeting of the Academy started at 10 a. m., Sunday, May 18, with the reading of the president's annual report. Dr. Andreae's report appears in full in this issue, as does Secretary-Treasurer Carel C. Koch's annual report, which he read at the opening session.

The report of the research projects committee by Dr. Robert E. Bannon and the report of the committee on nomenclature and standards by Dr. Glenn A. Fry were also presented. These reports also appear in this issue.

CHICAGO MEETING PLACE FOR DECEMBER

Using the results of the Academy poll as an unofficial guide to where and when the 1947 annual meeting should be held, the time and place committee of the Academy recommended Chicago, Illinois, as the place, and December as the month.

Most members appeared anxious to get Academy conventions back on "schedule," and at the final session Wednesday afternoon, May 21, voted to accept the recommendation of the committee.

Academy members agreed, however, that the exact date in December could not be decided until a check had been made with Chicago hotels, and the secretary was delegated this job. He was also instructed to obtain a reservation starting on a Saturday rather than the traditional Sunday.

Following instructions, Dr. Carel C. Koch, secretary, stopped in Chicago en route to Minneapolis, and arranged for the annual meeting to be held at the Palmer House, Chicago, starting Saturday, December 13 through Tuesday, December 16, 1947. The time and place report was presented to the convention by Past-President Dr. Walter I. Brown.

OFFICERS

Also, at the final session of the convention May 21, members of the Academy unanimously approved and duly elected the candidates for office for the year 1947 recommended by the nominating committee.

Dr. Harold M. Fisher's election to the presidency already has been mentioned. The others elected are: Dr. D. G. Hummel, Cleveland, Ohio, vice president; Dr. Carel C. Koch, Minneapolis, Minnesota, secretary-treasurer. In accordance with Academy procedure, these officers automatically become senior members of the Executive Council.

Academy members also approved and elected the candidates presented for membership on the Executive Council, as follows: Dr. Robert E. Bannon, Hanover, New Hampshire; Dr. W. Edward Dewey, Battle Creek, Michigan; Dr. John R. Dean, Los Angeles, California; and Dr. Laurence P. Folsom, South Royalton, Vermont. The report of the nominating committee was presented by Past-President Dr. R. N. Walker.

PROGRAM CHAIRMAN

This year, the Academy regretfully accepted the resignation of Dr. D. G. Hummel, as program chairman for the annual meetings. Dr. Hummel has been program chairman for eight years, and each year has prepared educational programs second-to-none in the optometric world. Dr. Hummel will continue to serve the Academy as vice president, as already mentioned.

At the final session, the Academy paid tribute to Dr. Hummel for his work, and gave him a rising vote of thanks.

Dr. Hummel's resignation gave Dr. Fisher his first job as president

before he had been in office an hour—appointing a chairman to succeed Dr. Hummel.

He appointed Dr. Harold Simmerman, Woodbury, New Jersey, who reports he has already started to work on the 1947 program. Dr. Simmerman served as arrangements committee chairman for the 1946 meeting, and was also given a rising vote of thanks by the Academy at the final session.

EXECUTIVE COUNCIL ACTIONS

Two significant actions in regard to new members were taken by the Executive Council during its annual meeting sessions. Briefly, these are as follows:

(1) In the future, applications for Fellowship will be screened by the secretary, the chapter concerned, the examining board, and the Executive Council.

The examining board will classify the applicant according to Academy by-laws, rather than the secretary as has heretofore been the practice.

After an application has been acted upon, the examining board will then instruct the secretary to so notify the Executive Council, and following their final action the applicant will be advised of the action of the council.

(2) With the permission of the Executive Council, a local chapter now may set up a sub-examining committee which will work under direct supervision of the examining board. Sub-examining committees will conduct examinations twice a year, eliminating the necessity for applicants to wait until the annual meeting to be examined. This action by the Executive Council does not mean that it is mandatory for local chapters to set up sub-examining committees but is merely a provision to enable those who wish to do so.

Acting upon recommendation of the research projects committee, the following grant-in-aid was approved by the Council:

A $500 grant-in-aid to the University of California School of Optometry to assist them in a research project on accommodation-convergence relationships. This work to be done under the supervision of Dr. Meredith W. Morgan.

The Council also voted that the Academy should:

Continue grants-in-aid for ocular and visual research.

Establish one or more graduate scholarships in physiological optics or allied sciences, the candidates for these scholarships to be proposed

and selected by the deans of optometric schools and approved by the Executive Council of the Academy. The amount of the scholarship is to be set by the deans of the schools and approved by the Executive Council.

Furnish speakers upon request to educational centers, these speakers to talk on refraction, ethics and other matters pertaining to optometry.

Looking ahead to the next annual meeting, the Council voted to arrange a special luncheon in Chicago next December at which presidents and secretaries of local chapters, Academy committee chairmen, and the Executive Council can discuss in round-table fashion problems relating to admission requirements to both local chapters and the parent body. This is now being arranged through the secretary's office.

The Fellowships of two Academy members were revoked by the Council; one member being dropped for conducting an itinerant practice, and the second for failure to practice in accordance with Academy requirements.

The Vermont chapter's application to affiliate with New Hampshire Fellows was approved by the Council, and the chapter is now officially the "Vermont-New Hampshire Chapter."

BANQUET

A hot, muggy evening which made the men glad the dinner wasn't formal, and the women wish it were, did not mar the success of the annual banquet held Tuesday evening, May 20. "North Garden," a room identical to "South Garden" was the scene of the dinner.

Dr. J. Fred Andreae, president of the Academy, was the master of ceremonies, and after dinner presented to the audience, officers, and members of the Executive Council, as well as Dr. Albert Fitch and his wife who were guests of honor.

Regrettably, Dr. James P. C. Southall, Charlottesville, Virginia, was unable to attend the banquet and receive in person the honorary life fellowship voted him by the Academy.

In his absence, Dr. Robert E. Bannon accepted the Fellowship certificate for him, and briefly reviewed Dr. Southall's many services to the profession of optometry during the past years and especially his work in the field of physiological optics and optometric education.

Dr. Southall served for many years as the head of the School of Optometry, Columbia University, New York City.

In sending word to the Academy that he could not attend, Dr

Southall wrote the following letter,[1] which Dr. Bannon read to banquet guests:

"Your much appreciated letter, with its cordial and generous invitation to me to be present at the sessions of the American Academy of Optometry to be held in the city of Philadelphia, May 18-21, 1947, reached me day before yesterday.

"I wish with all my heart that I could accept this invitation and enjoy the pleasure that I know in advance would be in store for me. . .Yesterday when I showed my physician your letter and begged his consent, he shook his head and declared it would not be prudent for me to attempt the journey to Philadelphia. It is with real disappointment and sincere regret that I feel bound to abide by his decision.

"I am deeply sensible of the honour you have done me in recommending me for honourary membership in your illustrious academy; and I beg that you will convey to your associates this expression of my gratitude. One of my chief disappointments is that I cannot tell them so in person.

"The cause of professional optometry is very dear to me, and I shall never cease to do everything in my power to promote it. I never felt greater anxiety in behalf of it than I do now when everything on earth is being changed and revised. The public at large will never recognize optometry as a learned profession until it is firmly established in a number of our leading colleges and universities. . .The greatest source of weakness is the lack of uniform laws all over the country for the regulation of the practice of optometry. As long as that situation exists, unqualified men and women will be licensed to be optometrists and will drag down the profession."

A formal presentation of charters then was made to the Eastern Pennsylvania chapter of the American Academy of Optometry which organized this spring, and to the new Illinois chapter. The charters were presented to representatives of the chapters by Dr. J. Fred Andreae.

Following the presentation of the charters, Dr. Andreae introduced the speaker of the evening, Dr. Eugene Freeman of Chicago, Illinois.

In his quiet and earnest manner, Dr. Freeman stressed the importance of professionalism in optometry.

His paper, "Professional Ethics," appears in full as the editorial for this month's issue of the Journal.

After thanking Dr. Freeman for his excellent message, Dr. Andreae started to announce "that's all, folks," only to be interrupted by Dr. Arthur P. Wheelock, Des Moines, the retiring past president who said he had an important announcement to make.

Dr. Wheelock then presented to Dr. Andreae, on behalf of the Academy, a token of gratitude for his fine work in promoting the interests of professional optometry, his many years of service as secretary of the Academy and as a member of the Executive Council.

Dr. Andreae, touched and pleased with the gift, a thermos designed especially for traveling, pledged his continued support of the Academy in his office of past president and again expressed his hope that optometry would continue to gain as much stature in the professional world in the years to come as it has in the last few years.

1. To the Secretary, April, 1947.

Amid the ensuing applause, Dr. Andreae managed to complete his announcement, "that's all, folks."

VIRGINIA HUCK

PRESIDENT'S ANNUAL REPORT

DR. J. FRED ANDREAE, BALTIMORE, MARYLAND

It is a privilege and pleasure to address the Fellows of the American Academy of Optometry at this Silver Anniversary meeting. The first meeting I attended was the seventh, held in Washington, D. C. in 1926, and I am gratified that I have been able to attend every meeting since then. There were 26 Fellows on the roster in 1926 and today the number has increased to 421. During the early years our numerical increase was quite slow, due to the fact that Fellowship was by invitation and no organized effort was made to add to our membership. When the Fellows of the Academy realized that universal recognition of optometry, as a profession, was impossible unless all optometrists practiced in the manner laid down by Academy requirements, it was decided to invite eligible optometrists to affiliate. I am sure the results have justified our efforts.

One important factor in this connection has been the institution of local chapters and I feel the establishment of at least one chapter in every state in the union will be a definite step toward optometric recogtion nationally. The chapters of the Academy are as follows: Cuyahoga Chapter (Cleveland, Ohio); Eastern Pennsylvania Chapter; Illinois Chapter; Indiana Chapter; Iowa Chapter; Maryland Chapter; Michigan Chapter; Minnesota Chapter; New Jersey Chapter; New York Academy of Optometry; Vermont-New Hampshire Chapter; Southern California Chapter, and a new chapter in Columbus, Ohio. Active chapters can and will invite all eligible optometrists in their areas to become members. Membership in the local chapter is the first step toward Fellowship and the benefit and enjoyment of chapter relations by the individual member ultimately will lead to the affiliation of all eligible colleagues. It is hoped those not eligible will be inspired to take the necessary steps to qualify. The regular meetings of the chapter provide a means for the interchange of ideas so necessary to the improvement of office technique and a better understanding and solution of daily problems. Another very valuable asset is the opportunity offered to invite members of kindred professions and perhaps have them address the meetings. The

experience of the Southern California Chapter at Los Angeles is outstanding in this respect. Chapter membership very definitely brings about and fosters a fine spirit of fraternization, the lack of which is one of optometry's major faults and problems.

The question is voiced many times by interested non-members: "What is the benefit of Academy Fellowship?" A complete answer to this question is quite difficult. It can be pointed out that the mere fact of being a Fellow in the American Academy means there can be no question as to professional attributes and optometric ability. It may so happen, in the future, that patients will look for the Academy Fellowship certificate on the wall of your office. Membership in the Academy contributes toward the conduct of much needed optometric research and the larger the membership the more funds will be available for that purpose. During the year the Academy appropriated $2,000 divided as follows:

$1,000—Dartmouth Eye Institute, Hanover, N. H., for a study of refractive findings made both with and without a cycloplegic. This study was made by Dr. Robert E. Bannon.

$1,000—Ohio State University, School of Optometry, for a study on color vision. This study was made by Dr. Glenn A. Fry.

The privilege of attending our annual meetings not only gives one the opportunity of meeting your fellow members, but is of particular value because members hear not only the delivery of original papers, but benefit immeasurably by the discussions which follow. Many Fellows who now rank as outstanding contributors to our programs received their early inspiration at these annual meetings and were stimulated to begin some original study or research.

Your Executive Council has handled its problems during the year in able fashion and the reports of its individual members will cover the activities and progress of their respective assignments.

Dr. Dan Hummel, chairman, papers and program committee, has worked long and hard in preparing our program for this meeting. We see and hear the end result, but to attain this goal means the overcoming of difficulties which at times seemed insurmountable. Dr. Hummel takes it all in stride and we are, indeed, fortunate to have so capable a person to call upon.

Dr. Carel Koch, our secretary, is in the same category as Chairman

Hummel, insofar as results are concerned. His job, however, is never ending. To both of these grand, hard working Fellows, as well as the other councilmen, I express my grateful thanks. It has been a joy to serve the American Academy of Optometry and I hope the Fellows and officers will accord my successor the same loyal support and co-operation which has been my good fortune to enjoy.

SECRETARY-TREASURER'S REPORT

DR. CAREL C. KOCH, MINNEAPOLIS, MINNESOTA

Because of the labor unrest which culminated in a nation-wide coal strike in the late Fall of 1946, this report will cover the 17-month period since the last general meeting of the Academy. As secretary, the writer also refers to the annual report of the Academy which was published last December.[1]

LOCAL CHAPTERS

Two new local chapters have been organized since the first of this year. These are the Eastern Pennsylvania chapter and the Illinois chapter. This brings to 12 the number of local chapters now functioning in various parts of this country. These chapters are the Cuyahoga, Eastern Pennsylvania, Illinois, Indiana, Iowa, Maryland, Michigan, Minnesota, New Jersey, New York, Southern California and Vermont.

The last named chapter is now applying for a new charter to cover both Vermont and New Hampshire.

Several other groups of members are now in the process of setting up additional chapter organizations and are expected to file their applications for these during the remainder of 1947.

MEMBERSHIP

During 1946 the Academy elected to Fellowship 62 new members. Some of these applicants had been approved prior to our Columbus meeting but their election took place after December 1, 1945, and these new members became Fellows during the year 1946. Since January 1, 1947, the Academy has enrolled 22 new members, many of these through the newly formed Eastern Pennsylvania chapter.

The examining board, under the able chairmanship of Dr. R. M. Hall will meet here in Philadelphia at the Pennsylvania State College

[1]Carel C. Koch. Annual Report of Academy Secretary. AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF THE AMERICAN ACADEMY OF OPTOMETRY. 23, 12. 539-544. 1946.

of Optometry. As the result of these examinations several additional members will be admitted to Fellowship during the current quarter.

ACADEMY LOSSES BY DEATH

I regret to announce that since the last meeting of the Academy, we have lost four members by death. Most of these men have been active in the Academy since its earliest days and each made valuable contributions to optometric science. At this time the Academy pays tribute to Dr. Ewing Adams of Detroit, Michigan; Dr. E. T. Miller of Elgin, Illinois; Dr. Gustav O. Ohlsson of Detroit, and Dr. Max Prosser of Rochester, New York.

RESIGNATIONS AND SUSPENSIONS

Since our last meeting, three members of the Academy resigned, and during the same period five members were dropped for failure to pay their dues. As secretary, I also regret to announce that three members have been suspended for infractions of the rules relating to their practice in optometry.

ACADEMY BALANCE SHEET

Annual financial report of the American Academy of Optometry, cash transactions covering period December 4, 1945, to November 30, 1946.

Cash on hand December 4, 1945 (This item includes funds on deposit in Canada)	$3,848.27	
Receipts—December 4, 1945, to November 30, 1946, as follows:		
Membership dues	4,858.75	
Application fees	335.00	
1945 annual meeting receipts	351.00	
Book sales, etc.	168.64	
Total cash and receipts	$9,561.66	$9,561.66
Disbursements.		
Annual meeting. Items from budget, (1), (2), (5), (24 to 35)	$1,635.95	
President's annual allowance. Item from budget, (3)	150.00	
Secretary's annual allowance. Item from budget, (4)	150.00	
Academy operating costs. Items from budget, (6 to 16)	940.60	
Archives. Item from budget, (17)	43.00	
Examining board. Item from budget, (18)	7.99	
Committee on research projects. Item from budget, (19)	2,020.00	
Local chapter refunds. Item from budget, (20)	463.16	
Speakers at 1945 annual meeting reprints. Item from budget, (31)	459.00	
Exchange and refunds to applicants	42.58	
Total disbursements	$5,912.28	$5,912.28

RECAP
December 4, 1945, to November 30, 1946.

Total cash and receipts	$9,561.66	
Total disbursements	5,912.28	
Balance on hand November 30, 1946, in banks in Minneapolis and Toronto		$3,649.38

Annual financial report of the American Academy of Optometry, cash transactions covering period December 1, 1946, to April 30, 1947.

ACADEMY BALANCE SHEET

Cash on hand December 1, 1946 (This item includes funds on deposit in Canada)	$3,649.38	
Receipts—December 1, 1946, to April 30, 1947, as follows:		
Membership dues	5,008.75	
Application fees	320.00	
Charter fees	10.00	
Book sales, etc.	83.76	
Total cash and receipts	$9,071.89	$9,071.89
Disbursements.		
Annual meeting. Items from budget, (1), (2), (5), (24 to 35)	$ 264.45	
Academy operating costs. Items from budget, (6 to 16)	597.25	
Archives. Item from budget, (17)	824.00	
Examining board. Item from budget, (18)	75.00	
Speakers at 1945 annual meeting reprints. Item from budget, (31)	139.03	
Exchange and refunds to applicants	35.87	
Total disbursements	$1,935.60	$1,935.60

RECAP
December 1, 1946, to April 30, 1947.

Total cash and receipts	$9,071.89	
Total disbursements	1,935.60	
Balance on hand April 30, 1947, in banks in Minneapolis and Toronto		$7,136.29

CONCLUSION

In the annual report of the Academy already referred to, the writer has touched on the splendid work done by the research projects committee and the program and papers committee headed respectively by Doctors R. E. Bannon and D. G. Hummel. I have also commented on the newly published roster, two copies of which have now been issued since our last meeting.

The English translation of Dr. Edward Hering's "Spatial Sense and Movements of the Eye" by Dr. Carl A. Radde, continues to sell, and has brought to the Academy considerable favorable comment.

At this time I wish again to express my sincere appreciation to the members of the Executive Council for their assistance and co-operation in the administrative work carried on in behalf of the Academy, and I particularly wish to express to our immediate past president, Dr. Arthur P. Wheelock and Dr. J. Fred Andreae, who has served the

Academy as president during the past two years, our appreciation for their untiring efforts in behalf of this organization.

The Academy is in sound financial position and starts its 26th year with a loyal membership ready to do its part in serving optometry and the public during this reconstruction period.

ANNUAL REPORT OF THE COMMITTEE ON NOMENCLATURE AND STANDARDS

During the past year the committee prepared a special report entitled, "Definition and Measurement of Cyclophoria with Converged and Elevated Lines of Sight." This report has been submitted to the Executive Council for approval for publication in the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

It is recommended that during the ensuing year a special report be prepared dealing with the definition and measurement of lateral and vertical deviations for peripheral directions of regard.† Practical applications are found in the measurement of hyperphoria at the reading level and in analyzing the lateral and vertical components of phoria or tropia in the periphery of the field of fixation which becomes pronounced in cases of paralytic squint. A project which has been under consideration for several years is the preparation of a report dealing with the history of terms relating to accommodation, convergence, and eye movements. A third project which might be proposed is the development of a system of terminology relating to versions, ductions, and rotations. The system developed by Lancaster should be considered, at least as a base from which to start.

GLENN A. FRY, Chairman
C. L. TRELEAVEN
C. A. RADDE
RITA WALSH
E. L. HIGGINS

REPORT OF THE RESEARCH PROJECTS COMMITTEE*

I. PURPOSE OF COMMITTEE:

As stated in Memorandum No. 5 (January 20, 1945) from Carel C. Koch, secretary, to the Executive Council; the purpose of this com-

†A report now ready for publication.

*For the period January 1946-May, 1947. Including reference to the January-December, 1945, report.

mittee is: ". . . to make recommendations to the Executive Council on matters having to do with optometric research. It is not expected that the committee itself engage in research work, but rather that the committee arrange that specific research problems are studied by persons capable of conducting these studies in suitable educational centers and that the Academy assist in the financing of these research activities through the allocation of Academy funds which will be appropriated for this purpose by the Executive Council."

II. ACTIVITIES:

In 1945, the committee recommended to the Executive Council, and action was approved, to grant $500.00 to the University of California for research by Dr. Meredith Morgan. The projects were:

1. A New Theory for Control of Accommodation.

   The results of this investigation were reported by Dr. Morgan at the Academy meeting held in Columbus, Ohio, in December, 1945, and published in the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF THE AMERICAN ACADEMY OF OPTOMETRY, March, 1946.

2. Investigation of the Direction and Final Resting Place of the Visual Axes when Fusion is Broken as in Direction and Fusional Reserve Tests.

   The results of this investigation were published in the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF THE AMERICAN ACADEMY OF OPTOMETRY, January, 1947.

3. Investigation of Techniques Employing Stereoscopic Targets for the Orthoptic Treatment of Binocular Anomalies.

   The results of this investigation will be published in the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF THE AMERICAN ACADEMY OF OPTOMETRY in the near future. The manuscript is in the publisher's hand at the present time.

The Academy is proud of the opportunity to assist in the research which Dr. Morgan has conducted. The money given by the Academy was used by Dr. Morgan to purchase instruments, targets, drawings and cats used in first investigation. It should be realized that the small Academy grant in no way covers completely the expenditures entailed in Dr. Morgan's work. The Academy hopes that they may be able to assist Dr. Morgan in his future work.

In 1946, the research projects committee recommended to the Executive Council, and action was approved, to grant $1,000 to the Dart-

mouth Eye Institute for an investigation on "The Use of Cycloplegics in Refraction" supervised by Robert E. Bannon.

The results of investigation will be presented at the current meeting of the Academy and will be published in the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF THE AMERICAN ACADEMY OF OPTOMETRY.

The money received from the Academy did not cover the total cost of the project in any sense, but was used primarily to assist in defraying the expense of clerical help, drawings, translation of foreign literature, etc.

Also, in 1946, the research projects committee recommended to the Executive Council, and action was approved, to grant $1,000 to the Ohio State University for use by Professor Glenn Fry to assist in purchasing instruments and apparatus for an investigation of color vision.

Professor Fry has reported that progress has been made in accruing part of the apparatus for his experiments and a report on the results of his investigations will be forthcoming in the near future.

The committee has considered a few projects suggested by individual optometrists during the past year, but no action has been taken as those submitting suggestions did not indicate how their ideas could be investigated. There is not a dearth of suggestions on research projects that should be done, but there is a dearth of possibilities as to how the actual investigations suggested can be carried out.

The research projects committee welcomes suggestions for research projects, but, more important, they welcome requests for assistance on projects that have been planned out with respect to how and by whom the projects suggested may be carried out.

The research projects committee is considering, and will welcome suggestions on the furtherance of Academy aid to assist in scientific investigations. In the opinion of this committee, the Academy can serve optometry best by encouraging candid investigations not only on basic aspects of vision, but also on various practical techniques and instrumentation.

ROBERT E. BANNON, Chairman
JULIUS N. NEUMUELLER
RICHARD M. HALL
GLENN A. FRY

ACADEMY REGISTRATION AT PHILADELPHIA MEETING

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Dr. M. P. Costantini, Trenton, New Jersey; Mr. Maurice E. Cox, New York, New York; Dr. W. Edward Dewey, Battle Creek, Michigan; Dr. T. E. Donoghue, Wilson, North Carolina; Dr. V. J. Ellerbrock, Columbus, Ohio; Dr. William Feinbloom, New York, New York; Dr. Irving P. Fildermaan, Memphis, Tennessee; Dr. L. E. Firestone, Detroit, Michigan; Dr. Harold M. Fisher, New York, New York; Dr. Albert Fitch, Philadelphia, Pennsylvania; Dr. Lawrence Fitch, Newtown, Pennsylvania; Dr. Laurence P. Folsom, South Royalton, Vermont; Dr. Benton Freeman, Allentown, Pennsylvania; Dr. Eugene Freeman, Chicago, Illinois; Dr. Glenn A. Fry, Columbus, Ohio; Dr. C. L. Grigware, Grand Rapids, Michigan; Dr. Harris Gruman, Lebanon, Pennsylvania; Dr. R. M. Hall, Cleveland, Ohio; Dr. Sidney S. Haniford, Buffalo, New York; Dr. Clyde J. Hathaway, Pontiac, Michigan; Dr. Norman B. Hays, Niagara Falls, New York; Dr. W. J. Heather, Southbridge, Massachusetts; Dr. Wayne Helmbrecht, Warren, Pennsylvania.

Dr. H. W. Hofstetter, Columbus, Ohio; Dr. Thomas E. Holleman, Winston-Salem, North Carolina; Dr. D. G. Hummel, Cleveland, Ohio; Dr. Henry A. Imus, Washington, D. C.; Mr. Fred Jobe, Rochester, New York; Dr. Clifford C. Johnson, Spartanburg, South Carolina; Dr. Arthur S. Kitchen, Clearwater, Florida; Dr. Carel C. Koch, Minneapolis, Minnesota; Dr. J. Donald Kratz, Souderton, Pennsylvania; Dr. Bernard B. Kushner, Trenton, New Jersey; Dr. Louis I. Levinson, Salem, New Jersey; Dr. O. L. McCulloch, Holyoke, Massachusetts; Dr. Wm. J. McEvoy, Doylestown, Pennsylvania; Dr. E. H. Manwiller, Philadelphia, Pennsylvania; Dr. E. J. Margaretten, New York, New York; Dr. Roy Marks, Dayton, Ohio; Dr. Frances P. Marshall, Washington, D. C.; Dr. Arthur R. Neale, Paterson, New Jersey; Dr. John C. Neill, Philadelphia, Pennsylvania; Dr. J. F. Neill, Philadelphia, Pennsylvania; Dr. Julius Neumueller, Haddonfield, New Jersey.

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CHAPTER ACTIVITIES

EASTERN PENNSYLVANIA CHAPTER

At the annual business meeting of the Eastern Pennsylvania Chapter held May 6, the following officers were re-elected to serve for the coming year: Dr. William O. Vivian, Media, president; Dr. Luther A. Garns, Philadelphia, vice president; Dr. William G. Walton, Jr., Merion, secretary-treasurer. Dr. John C. Neill, Dr. Lawrence Fitch, and Dr. W. Sutor, all from Philadelphia, were elected to serve on the executive council.

The chapter also went on record approving the arrangement of diversified educational programs.

MARYLAND CHAPTER

The Maryland Chapter of the American Academy of Optometry held a joint meeting April 24 with the trustees of the Maryland Free Clinic of Optometry and the Baltimore study group.

Dr. Harold Simmerman, faculty member of Pennsylvania State College of Optometry, was guest speaker and presented a lecture on amblyopia.

At the business meeting of the chapter the following committees were appointed: Program, Dr. Israel Dvorine, chairman; Membership: Dr. J. T. Ebauer, chairman.

CURRENT COMMENTS

Virginia Huck
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

LAST CALL FOR A.O.A. CONVENTION

There's just time to pack your bag and catch a train for Atlantic City to hear the excellent educational program planned for the AOA Golden Jubilee convention by the program committee with the cooperation of our schools of optometry.

The convention is being held at the Hotel Chelsea, Atlantic City, New Jersey.

"SEEING AHEAD"

A report on public relations activities which might well serve as a guide to any organized optometric group engaged in, or embarking on a public relations program has just been received from the Public

Health Bureau of the New York State Optometric Association. The report is entitled, "Seeing Ahead," and outlines in detail the activities of the bureau during the past year in the field of public relations.

Working toward the advancement of professional optometry, for better public understanding, and improved visual care for all, the bureau enlisted the aid of educators, industrialists, vocational guidance counselors, librarians, and nurses to distribute optometric literature stressing professional eye care and conduct visual care programs throughout the state of New York.

In addition, through the media of the press and radio the bureau informed the public of the advantages of professional eye care.

The bureau also conducted an all-out drive for the elimination of optometric telephone directory advertising in New York City, with good response.

While the plans used by the Public Health Bureau may not be particularly new, commendation is due them for their effort and planning to make the program effective. Not only is the state of New York benefited, but also optometry as a whole.

"Seeing Ahead" was published at 17 John Street, New York, 7, New York.

CONTACT LENS RECORD CHART DESIGNED

A new optometric record chart designed especially for optometrists fitting Feincone contact lenses has now been designed by Feinbloom Contact Lenses, Inc., New York, New York.

On one side of this chart, space has been provided for contact lens refractive data, progress reports, observations on the palpebral aperture, depth of the lower lid, lid tension, conjunctival tissue, the plane of the lids, and of course, for the regular routine data on the patient.

On the reverse of the chart, headed "trial fitting," a suggested standard method for indicating corneal and limbal clearance, and tight and loose areas is given, also diagrams of contact lenses on which fitting data can be graphically recorded. Also included on the reverse is space for the patient's tolerance record.

DR. ELMGREN ELECTED PRESIDENT

Dr. T. A. W. Elmgren, Columbia, South Carolina, was elected president of the College of Syntonic Optometry at its first postwar assembly held in Kansas City, Missouri, May 17-18.

Others elected include: Dr. H. W. Hagenaugh, Kansas City, Missouri, vice president; Dr. Earl C. Scott, Piqua, Ohio, secretary-treasurer. Trustees elected are: Dr. Preston Kline Caye, Los Angeles, California;

Dr. S. Herman Shurin, Kansas City, Missouri; Dr. Ben H. Kaplan, Michigan City, Indiana; and D. J. I. Rockwell, Cleveland, Ohio.

A.O.A. SPONSORS INTERNSHIP PLAN

Members of the American Optometric Association have already received a bulletin from Dr. F. A. Bemis, director of the Department of Assistance to Graduates, outlining the semi-internship plan currently being sponsored by the A.O.A.

The idea of a new graduate interning with an established practitioner is not new, but today, when cost of living has climbed to a new high and the optometric field is becoming more crowded, a plan such as this is more important than ever. For years many doctors have been helping new graduates in just this way, but many more are needed who will take a newly licensed optometrist into their office, thereby furnishing him incomparable experience and at the same time sufficient compensation at the start of his optometric career to bridge the period when commercial optometry appears the most enticing financially.

As pointed out by Dr. Bemis in his bulletin, prospective licensees are looking to established practitioners for guidance and assistance in making a start, and the time to offer this assistance is now, not after the graduate has had a chance to become disillusioned and forget what he learned about professionalism in school.

Briefly, the internship plan as outlined by Dr. Bemis is as follows:

Take a new licensee into your office as an assistant; at first let him help in any way possible—record findings, make out field charts, give visual skill tests, visual training—until he is ready to take over actual refraction, and consultation with patients. Compensate him sufficiently so that he does not have to constantly worry about paying his bills and ultimately start thinking of commercial optometry as a way out of financial difficulty.

In regard to compensation, the A.O.A. plan has set up minimums for the practitioner to follow, namely, $25 weekly for the first two weeks, after which time the assistant should be paid for each additional service performed: $1.00 for each field chart, visual skill test, visual training period (or one-half the fee per period), delivery (adaptation), progress report, and consultation, with $2.50 the minimum for a thorough refraction and mounting selection.

On such a basis, and we again quote Dr. Bemis, an assistant optometrist could gain valuable experience and earn from $50 to $100 a week, and the employing optometrist certainly cannot lose.

BOOK NOTICES AND REVIEWS

Books received are acknowledged by notices in this department. Special selections will be made for more extensive review in the interest of our readers as space permits.

RESEARCHES ON NORMAL AND DEFECTIVE COLOR VISION. W. D. Wright. Published by C. V. Mosby Company, St. Louis, Missouri. 1947.

This book is a convenient compilation of the studies of normal and defective color vision which have been made by Wright and his colleagues.

The book is not a complete treatise on color vision. No attempt is made to provide the reader with an insight into the historical development or total scope of the science of color vision. However, the first two chapters were written to provide the reader with a brief sketch of the fundamental knowledge of the eye and visual processes, and with an introduction to the outstanding contributions made by other investigators in the past decade. These chapters also give insight into how the author is trying to think through the relation of his own researches to those of his predecessors and contemporaries.

The book contains a thorough description of the revised model of Wright's colorimeter and the accessories which have been used in the various investigations. Other new instruments, such as a subjective photometer for binocular matching and a brillmeter, are also described.

Perhaps the greatest single contribution of Wright's work to the measurement and specification of color, is his investigation of the color mixture data of 10 of the 17 subjects used in arriving at a set of data for a standard observer which has been adopted by the International Commission on Illumination. Any colorimetrist who is curious enough to want to know how these data were secured, will find Wright's new book a valuable asset.

The book brings together for the first time the separate studies that have been made by Wright and his colleagues of the color mixture data, wavelength and purity discrimination data, and luminosity data of normals, protanopes, deuteranopes, deuteranomals, protanomals, and monochromats. These data are already classical. Anyone who is interested in testing color-blind persons or in any project of "human engineering" involving color-blindness will find the book a ready and useful reference.

In spite of the immense practical value of these researches, one can-

not fail to appreciate that they throw a great deal of light on the mechanisms subserving color vision. A good many of the researches and the discussions are aimed directly at the theory of color vision. Examples of such studies are those that deal with the dichromatism of the normal fovea for small objects, the characteristics of normal parafoveal vision in which the rod and cone functions are mixed, the role played by the macular pigment, and chromatic adaptation. Students or research workers in color vision cannot afford to overlook these important contributions.

GLENN A. FRY

SQUINT AND CONVERGENCE. N. A. Stutterheim. Published by H. K. Lewis and Co. Ltd., London, 95 p. 1946. 15s.

The author proposes ". . . to place a new conception of squint before the medical profession." He favors the functional, rather than the anatomical, viewpoint and concludes: ". . . that concomitant strabismus, like eyestrain, is a disorder of the visual brain, due to insufficient action of the centre for convergence in the midbrain." The work of the physiologist, Sherrington, as well as the author's clinical experience, serve as the basis for the conclusions reached.

In Part I are discussed terms used and the theoretical aspects of the problem of strabismus. Perhaps of greatest significance is the author's distinction between adduction and convergence. He states: "But convergence, the new visual kinetic power, is a functional unit of bi-foveal perceptual level and, contrary to what is commonly accepted, is allied to neither accommodation nor adduction." In Part II, the author presents his technique of curing concomitant convergent strabismus cases which are not complicated by paralysis. His methods consist chiefly of increasing the amplitude of convergence by means of a manually operated battery of prisms (90° to —8°) while the patient is fixating a narrow strip of white or brightly colored cardboard (size not given) fixed in the center of a well illuminated flat black screen (3½ ft. sq.) situated 18 feet from the patient. Often one or more "surgical adjustments" are necessary after a range of convergence and stereoscopic vision have been attained. Case histories of 28 patients are presented with graphs illustrating the progress of the increase in convergence amplitudes. The appendix describes the simple but ingenious implements which the author has found helpful and also presents practical suggestions for inexperienced practitioners.

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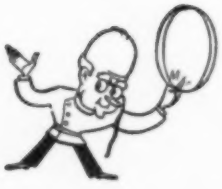

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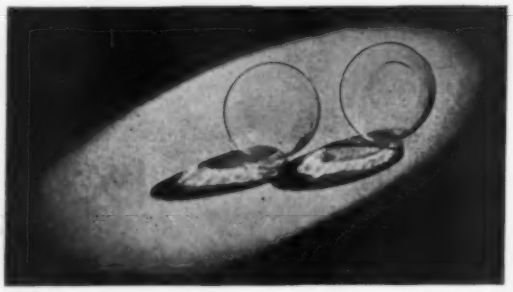

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About one-half of the space is devoted to technical articles, and the remaining half is given over to special departments, editorials, abstracts and book reviews, in large part original.

The papers and reports are original and are accepted only with the understanding that they are to be published in this journal exclusively.

The editors of the American Journal of Optometry and Archives of American Academy of Optometry beg to offer the following suggestions to authors who propose to favor them with the publication of their contributions:

I. Write on one side of the paper. Double-spaced, typewritten MS. is preferred.

II. Words to be printed in *italics* should be underscored once, in SMALL CAPS twice, and in LARGE CAPITALS three times. Antique type when called for should be so marked.

III. Be sure that the title of your paper indicates its contents. Should the subject be a general one, for instance, Case Reports, it would be well to mention the subject of each special report—for instance: Case One. Progressive Myopia with Exophoria. Case 2. Divergent Squint with Amblyopia. These special titles will appear in the table of contents of each number.

IV. Illustrations should be carefully drawn with India Ink on separate sheets.

V. When authors receive proofs for revision, they should correct and return these without delay. We beg, however, to remind our contributors that changes in the manuscript necessitates resetting, this causing much additional expense, so we ask that alterations be limited to what is of essential importance.

VI. Because of the added cost, we have discontinued the giving of gratuitous reprints to our authors, but we will supply them with these at the cost of press work and paper where so desired. The following tables of charges will apply for the year 1947.

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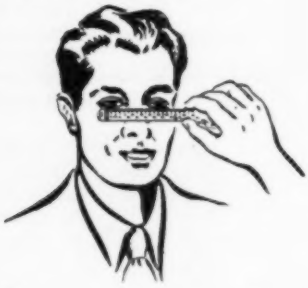

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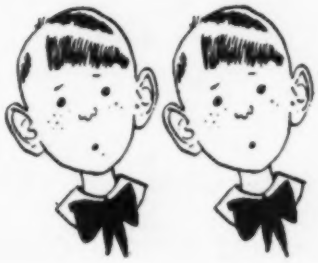

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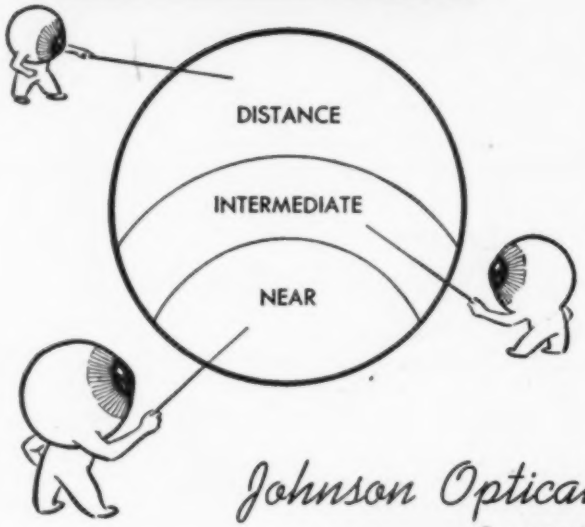

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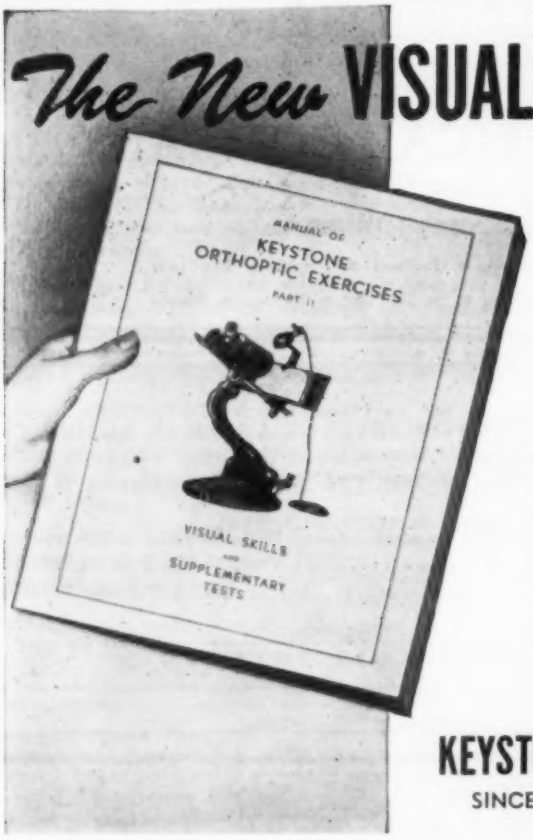

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